IBM

Electronic Typewriter

Service Manual

IBM Electronic Typewriter 50
IBM Electronic Typewriter 60

IBM ELECTRONIC TYPEWRITER
SERVICE MANUAL CONTENTS
(Alphabetical)

The IBM Electronic Typewriter Models 50 and 60 are 96 character, single element machines. The use of an electronic logic board in the machines reduces the amount of mechanical parts and increases the applications of the typewriter, compared with previous machines. Both 15.5 inch (394 mm) and 19.1 inch (485 mm) machines are available.

The machine is designed for use in applications similar to the IBM "Selectric" Typewriter models.

As text is entered at the keyboard, it is passed through the logic board, which sends electrical signals to the carrier and electro-magnets within the machine. The logic board stores one line of text information. This allows the operator to carry out some typing operations automatically and also provides some new features. The stored line of information is cleared during a carrier return operation.

STANDARD FEATURES OF THE IBM ELECTRONIC TYPEWRITER

AUTOMATIC CENTERING

Centering is an automatic electronic function when a coded K is typed before the text.

AUTOMATIC WORD UNDERSCORE

A word may be underscored automatically by entering a coded I after the word has been typed.

AUTOMATIC LINE UNDERSCORE

A line may be underscored automatically by entering a coded U at the beginning and a coded I after the line has been typed.

ELECTRONIC LEFT MARGIN

The function of the left margin is performed by the logic board. The machine has no margin rack or mechanical margin stops. A coded W is used to set the left margin.

Model 50

Model 60

ELECTRONIC RIGHT MARGIN
The function of the right margin is performed by the logic board. The position of the right margin is called line length setting. A coded T is used to set the right margin.

ELECTRONIC TABULATION
The tab function is performed by the logic board. Tabs are set by a coded S. Single tabs are cleared by a coded D and all tabs are cleared by a coded A. The machine has no tab rack or tab mechanism.

DECIMAL TABULATION
The decimal tab feature is designed for typing columns of figures aligned to a decimal point. A coded number before a figure to be typed positions the carrier so that the decimal point is in the correct position.

AUTOMATIC CORRECTING TAPE MECHANISM
Allows the operator to correct errors from the keyboard by depressing the backspace key only.

PITCH SELECTION
Allows the operator to type in 10 pitch, 12 pitch or proportional spacing.

REQUIRED TABS (PARAGRAPH INDENT)
The required tab feature allows the operator to type material automatically indented.

SELECTIVE RIBBON MECHANISM
This feature allows the operator to use the IBM Tech III Ribbon, Film Ribbon or the Correctable Film Ribbon.

OPTIONAL FEATURES

DEAD KEY DISCONNECT
The dead key disconnect feature allows the operator to cancel the no-escapement function of characters that normally do not require escapement.

DUAL LANGUAGE
This feature allows a second language to be typed on the typewriter with an appropriate typehead installed.

MANUAL VELOCITY CONTROL
This feature allows the operator to make all characters on the keyboard print in either high or low velocity. This feature will also allow the machine to print with normal velocity for each character.

FUNCTIONAL CHECK

This functional check is a procedure that will indicate whether or not the machine has a malfunction. It includes checks of every function of the machine. Using this checking procedure on every service call will help locate failures. After any failure has been repaired, successful completion of the check will ensure that the machine is working correctly.

1. Visual Inspection – Check the machine for any loose, damaged or missing parts. Also, look for unusual material in the machine: pencils, erasers, paper clips, etc.

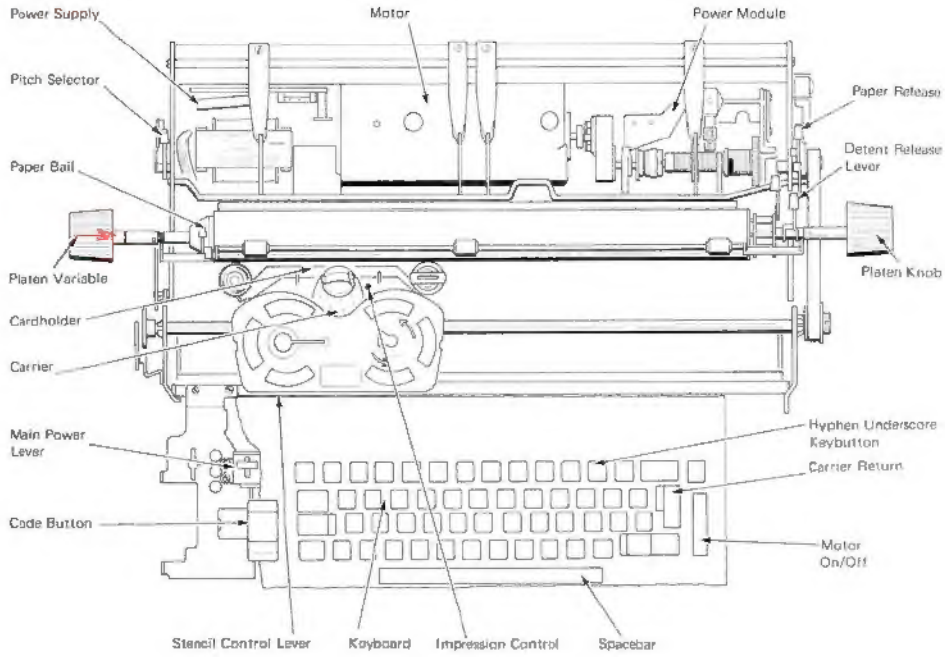
2. Paper Insertion – Insert a single piece of paper into the machine. It should feed straight and not wrinkle or tear.

3. Paper Release – Pull the paper bail forward. Check that the feed rolls hold the paper tightly. Pull the paper release lever forward. The paper should be free to move around the platen and left and right.

4. Detent Release – Rotate the detent release lever forward. Check that the platen will rotate and that the detent is disengaged from the ratchet.

5. Platen Variable – Push the left platen knob to the right. The platen should now turn freely; the ratchet should not turn. When the knob is released, the driver should reliably engage the platen.

6. Print Quality – Check the CE Aid playout. All characters should have even color and impression. No characters should be visibly out of position; there should be even spacing between characters. Check the print quality of the underscore.



7. Repeat Characters – Lightly depress the hyphen/underscore keybutton. The character should print one time when the keybutton is depressed. The character should repeat when more pressure is applied. Excessive pressure on the keybutton should not stop the repeat operation. Repeat this step for all other repeat characters.

8. Impression Control – Type a character with the impression control lever at 1 and then at 5. The sound of the typehead striking the paper should change and the character should appear darker in position 5.

9. Scales – Type a line of Vs in uppercase. The horizontal line on the cardholder should be parallel to the line of Vs.

10. The points on the bottom of the Vs should align with the vertical lines on the cardholder.

11. Operate the carrier return to the far left side. The carrier pointer should align with the 0 on the front scale.

12. Selective Ribbon System –

    a. Insert a single sheet of bond paper in the machine. With the impression control lever on 3, type all characters in upper and lowercase.

    b. Inspect the copy for character color and even density.

    c. Inspect the copy for ribbon flaking and ribbon particles on the copy.

    d. With a film ribbon installed on your machine, the lift pattern should look like this:

The characters should not overlap and should be positioned on the ribbon with a clearance from the top and bottom edge.

With a Tech III ribbon installed on the machine, inspect the ribbon pattern. The characters should overlap and there should be a clearance at the top and bottom edge of the ribbon. Type several lines of underscore. The type should not fade.

    e. Inspect the ribbon in its path around the guides and rollers. There should be no folds in the ribbon.

    f. Operate the spacebar. The ribbon should not feed.

    g. Place the stencil control lever in the stencil position and type several characters. The ribbon should not feed or lift.

13. Reset the left margin for the operator as it was when you started. This ends the detailed functional check.

POWER SUPPLY AND ELECTRICAL WIRING OPERATIONAL THEORY

The machine electrical wiring is of two types. The main electrical connection to the machine is made with a linecord to the primary power box (Figure 1). This provides line voltage to the motor and the transformer, through switches. The output from the secondary part of the transformer provides a low voltage supply for the power supply board. The power supply board provides direct current (DC) voltages which are used in the electronic sections of the machine and to operate the magnets.

The primary power box is located in front of the motor. The power switch is located in the left end of the box and the motor switch is located in the right end of the box (Figure 2). The linecord passes through the rear of the machine covers and is anchored by a cable clamp to the motor case.

The connectors for the motor and the transformer are located at the left rear of the primary power box.

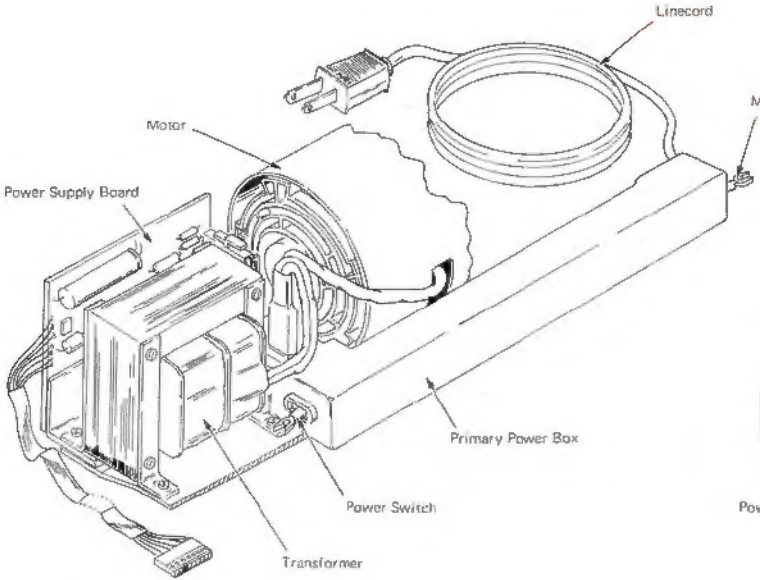


Figure 1 – Primary Power Box And Power Supply

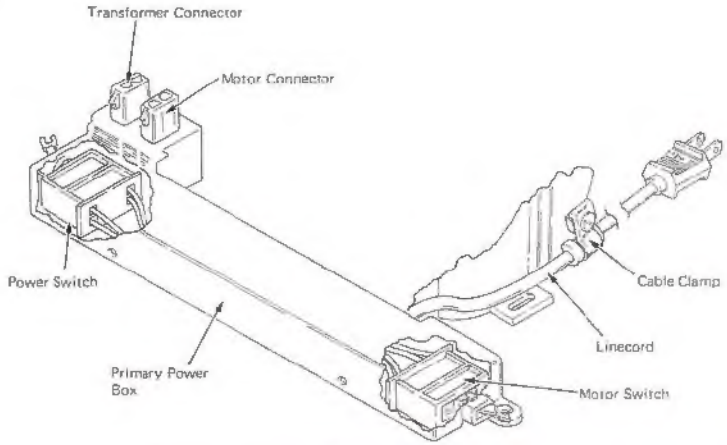


Figure 2 – Primary Power Box

The connections inside the primary power box are shown in Figure 3.

POWER SUPPLY

The purpose of the power supply is to provide the required operating voltages for the logic board and magnets (Figure 4). The power supply is a modular unit consisting of the transformer and the power supply board.

The output (secondary) voltages of the transformer are approximately 20 volts AC between the center pin and both outer pins, and 40 volts AC between the two outer pins of the three pin connector. The transformer is connected to the circuit board with this connector.

The output of the power supply consists of power supply ground, +5 volts DC, +12 volts DC and -5 volts DC. These output voltages are regulated by the power supply board with a change tolerance of plus or minus 10%.

The circuit board is a modular unit and is not field repairable.

The output of the circuit board is connected by a seven wire cable to the logic board. The output voltages may be measured from the top of the cable connector when it is plugged into the logic board. To make meter readings of the power supply output with the connector removed from the logic board, it is first necessary to connect pin 7 to pin 8.

The 8 pin on the power supply connector on the logic board is used to feedback -5 volts to the power supply. The output voltages will be interrupted electronically in the power supply if the -5 volts feedback is not complete. The reason for this protection is to prevent electrical damage to the logic board. This would result if the other voltages are applied to the logic board without -5 volts.

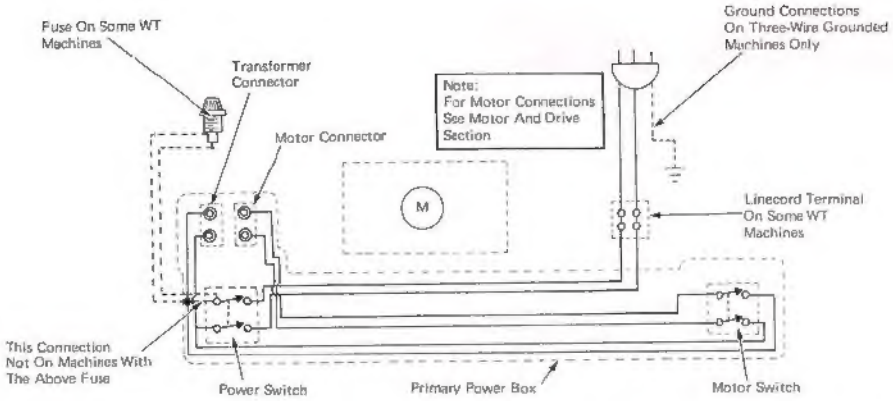


Figure 3 – Line Voltage Connections

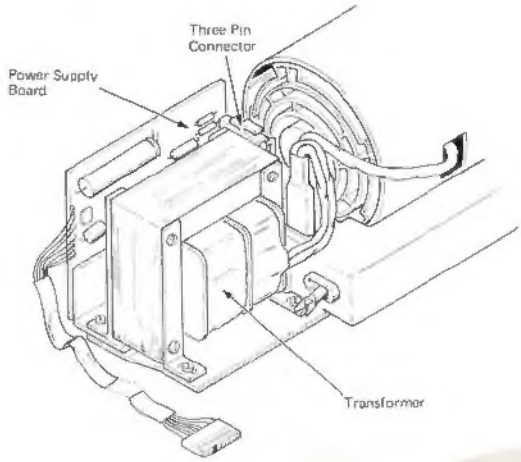


Figure 4 – Power Supply

The wiring harness groups the wires within the machine. The physical location of all electric and electronic components may be seen in Figure 4. The details of connections may be seen on the wiring diagram.

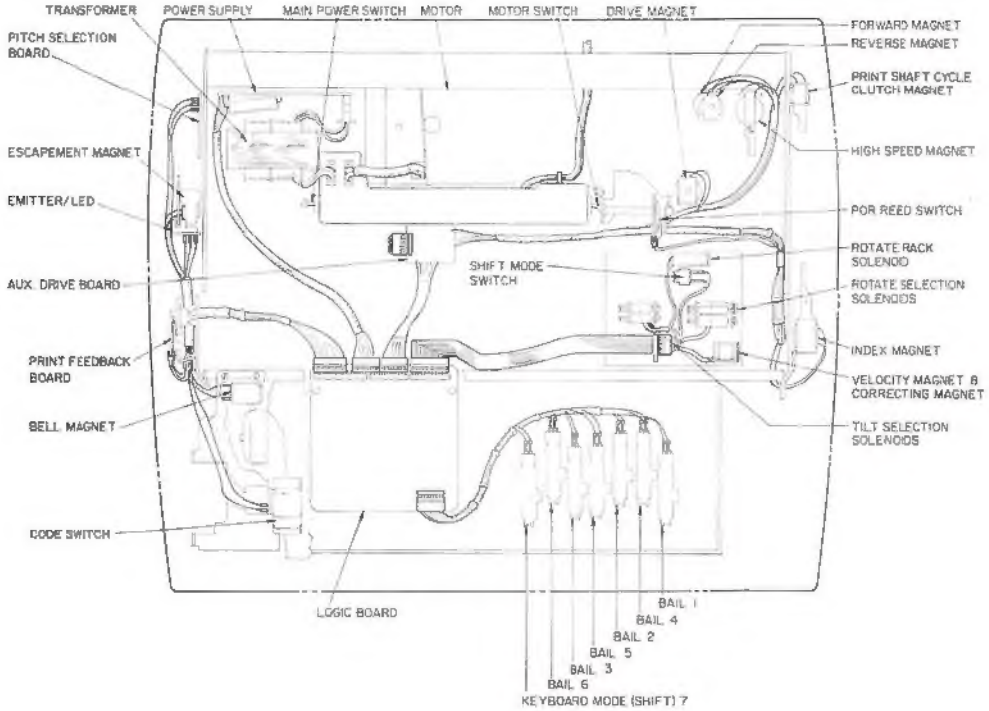


Figure 4 – Component Layout Diagram

The following table lists the abbreviations used on the wiring diagram, and explains the terms used. Physical location of connectors on the logic board are also shown in Figure 5 and Figure 6.

WIRING DIAGRAM INDEX

(Connectors are numbered from left to right looking at the hole.)

LEFT CABLE

1	CODE	(ALTC*)	Code contact
2	BELL		Bell magnet
3	PFB*		Print Feedback contact
4	GND		Power supply ground
5	+5 VDC	(+5V)	Five volts positive, DC
6	EMIT		Emitter contact
7	ESC		Escape magnet
8	BLANK		
9	P2C*	(P2)	Pitch switch (upper)
10	P1C*	(P1)	Pitch switch (lower)
11	GND		Power supply ground
12	+12 VDC	(+12)	Twelve volts positive, DC

OPTIONAL FEATURES CABLE

1	GND*		Power supply ground
2	DKC*	(DK)	Dead key contact
3	SLC*	(SL)	Secondary language contact

POWER SUPPLY CABLE

1	GND		Power supply ground
2	GND		Power supply ground
3	KEY	(K)	Key to hold cable
4	+5 VDC	(+5V)	Five volts positive, DC
5	+12 VDC	(+12V)	Twelve volts positive, DC
6	+12 VDC	(+12V U2)	Twelve volts positive, DC
7	-5 VDC	(-5V)	Five volts negative, DC
8	-5 VDC	(-5V)	Five volts negative, DC feedback

RIGHT CABLE

1	GND		Power supply ground
2	PORC	(KA)	Power on reset switch
3	PSCC	(CC)	Cycle clutch magnet
4	HIS		High speed magnet
5	REV		Reverse magnet
6	FWD		Forward magnet
7	IND		Index magnet
8	+12 VDC	(+12V)	Twelve volts positive, DC

CARRIER CABLE

1	V1		High velocity magnet (upper)
2	V2		Low velocity magnet (lower)
3	COR	(ER)	Correction magnet
4	+12 VDC	(+12V)	Twelve volts positive, DC
5	R1		Rotate magnet No. 1
6	GND		Power supply ground
7	RACK	(RKSH)	Rotate rack solenoid
8	SHMD	(PUC)	Shift mode contact
9	R3		Rotate magnet No. 3
10	T1		Tilt magnet No. 1
11	R2		Rotate magnet No. 2
12	T2		Tilt magnet No. 2

TRANSMIT CABLE

1	KBMDC	(SHIFT)	Keyboard mode contact
2	B6C*	(B6)	Selection bail contact
3	B3C*	(B3)	Selection bail contact
4	B5C*	(B5)	Selection bail contact
5	B2C*	(B2)	Selection bail contact
6	B4C*	(B4)	Selection bail contact
7	B1C*	(B1)	Selection bail contact
8	GND		Power supply ground

LONG CARRIAGE CONNECTIONS

1	LCC	Ground
2	LCC*	Long carriage contact

The above two contacts are on the logic board with a pluggable jumper for long machines. No cable connection.

*Shows switch or reed wiring points.

( ) Indicates label shown on the bottom of t logic board if not the same as on the wiring d gram.

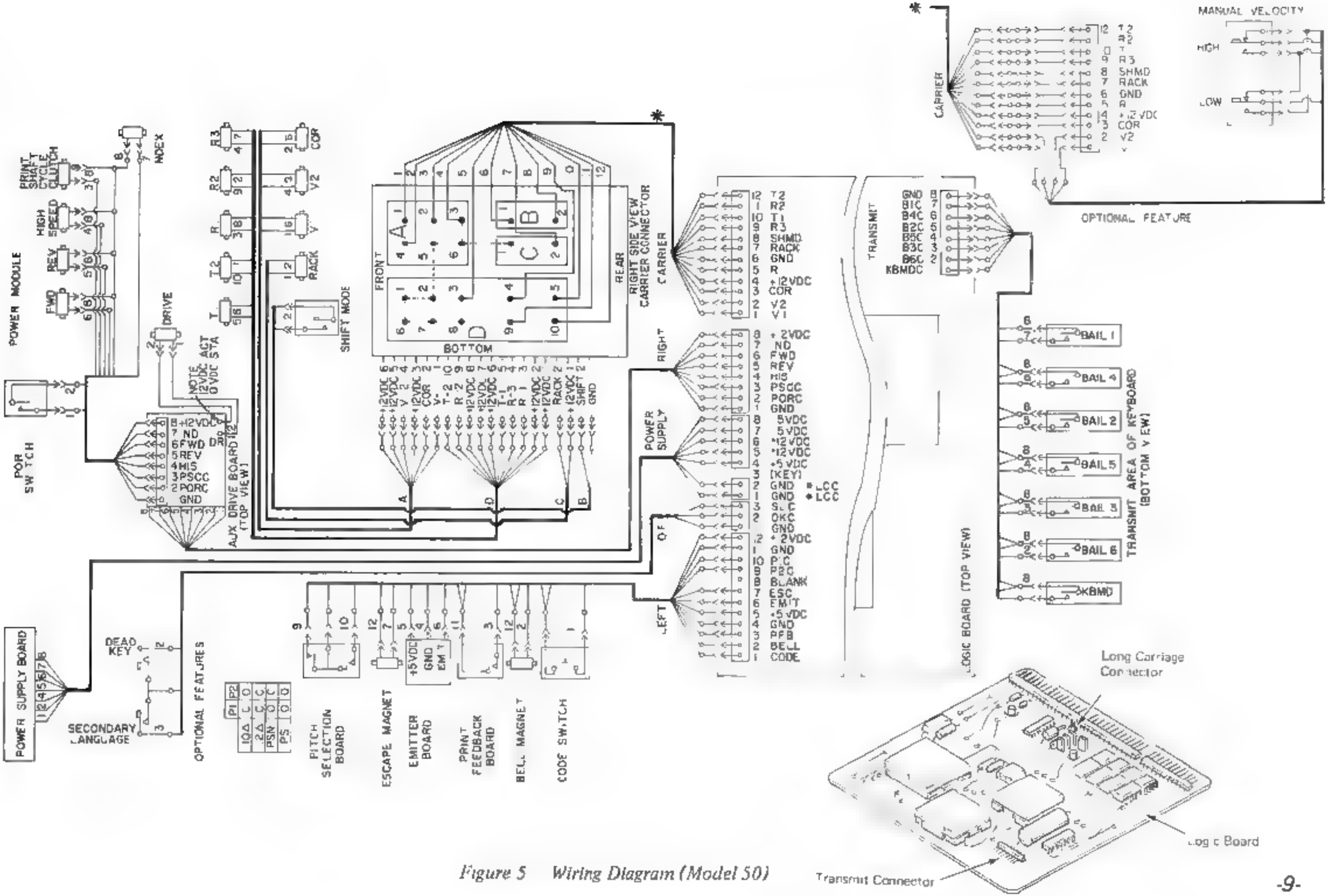


Figure 5   Wiring Diagram (Model 50)

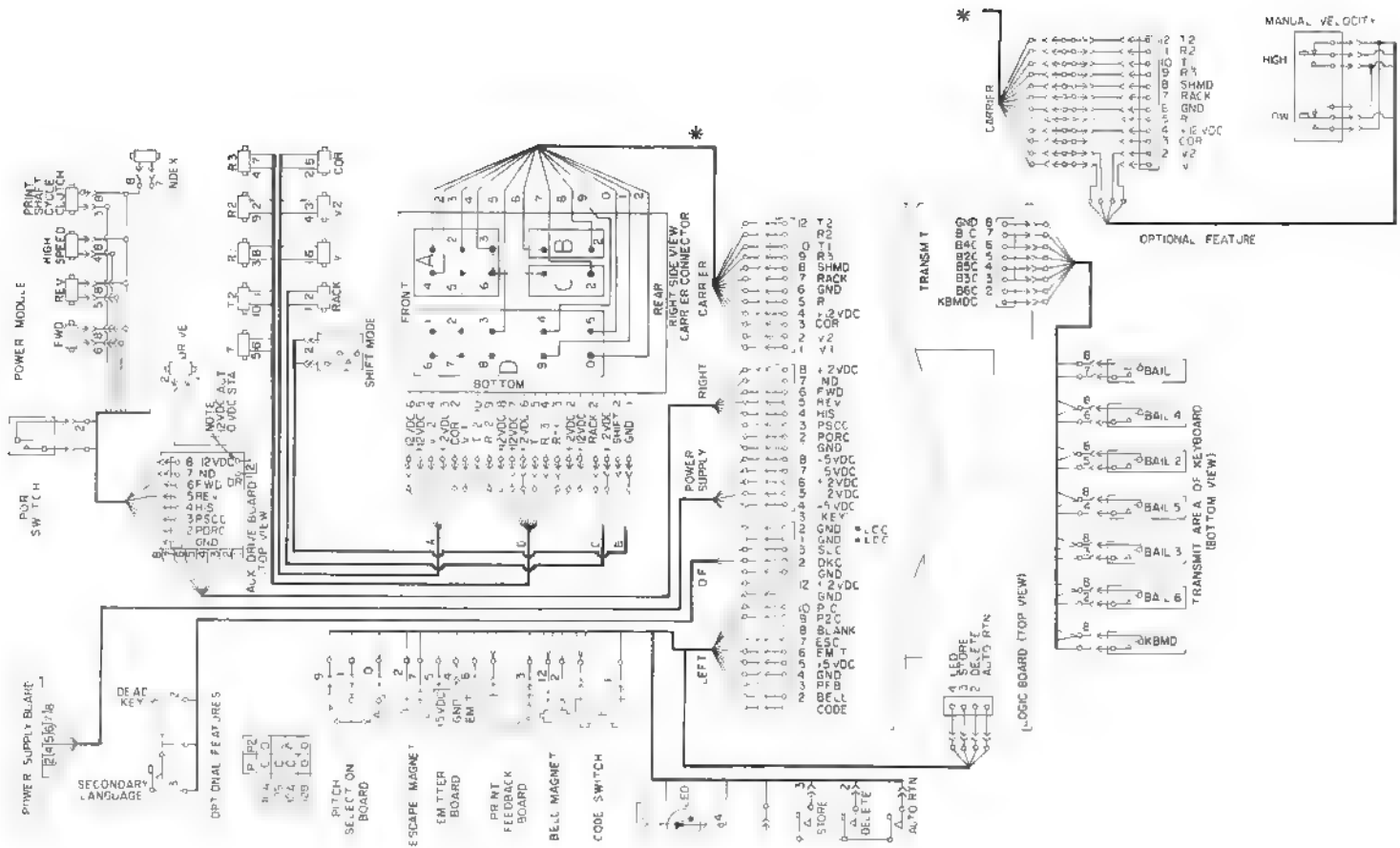


Figure 6 Wiring Diagram (Model 60)

MOTOR AND DRIVE OPERATIONAL THEORY

The purpose of the motor and drive mechanism is to provide a positive, constant drive

The motor drives the power module which distributes all drive motion for machine operations (Figure 1). Drive motion is used to drive the filter bail in the keyboard, to rotate the leadscrew to drive the carrier right or left, to rotate the index cam and drive the index mechanism, and in the carrier for the selection and printing of characters

MOTOR

The motor case mounts on the main frame The motor is supported in the case on shock mounts to absorb motor vibration (Figure 2).

The motor drive shaft extends from both ends of the motor. The pulley and belt drive the power module. The motor clutch allows the motor to start and reach some speed before engaging the motor pulley.

The cooling fan is mounted on the left end of the motor shaft, inside the case. The fan pulls air past the power supply and blows the air past the motor then out a vent at the rear

The electrical cable of the motor is fitted with a plug for connection to the primary power box

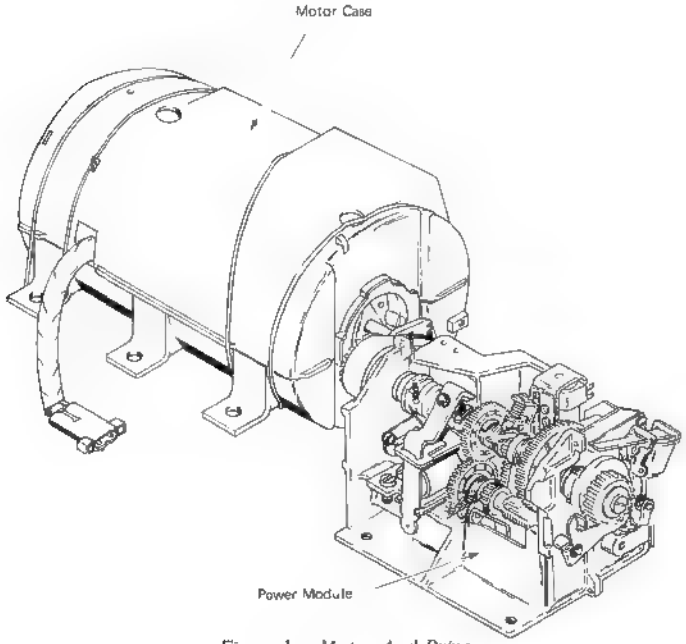


Figure 1 – Motor And Drive

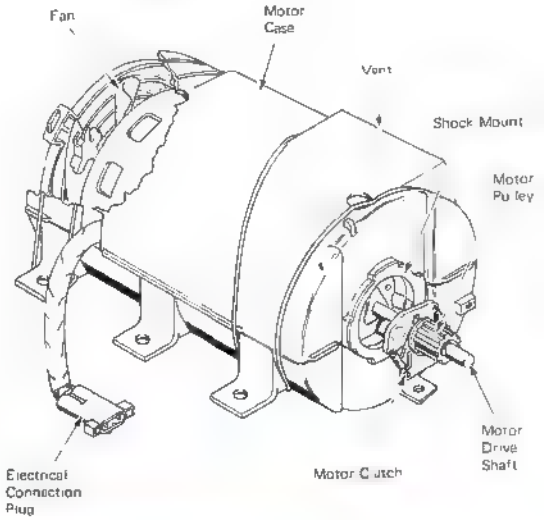


Figure 2 – Motor

The different types of electrical connections for the motor are shown in Figure 3

NOTE Electrical connections are discussed in the Power Supply and Electrical Wiring section

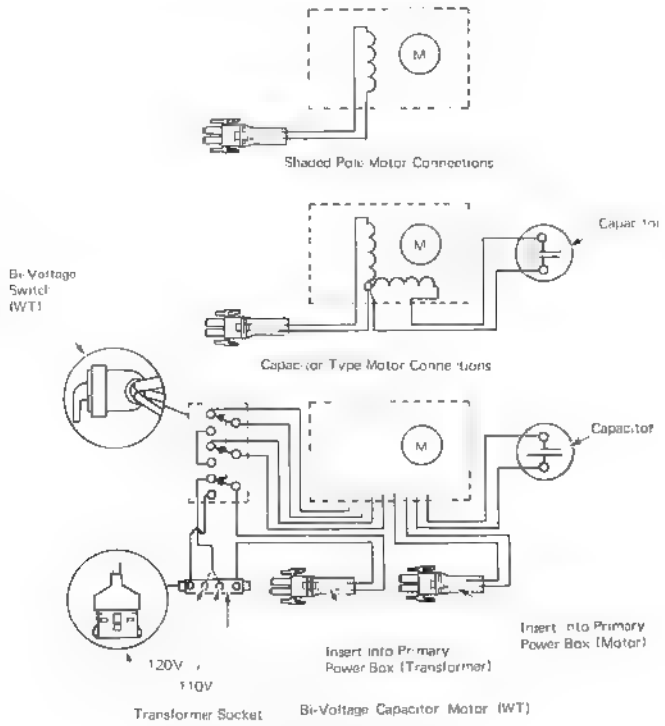
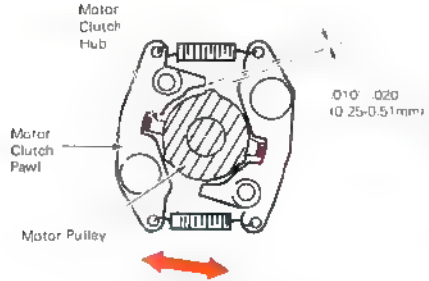
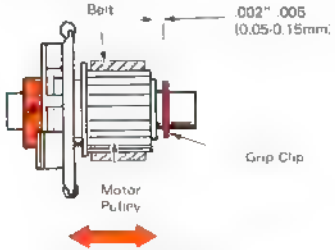


Figure 3 Motor Wiring Diagrams

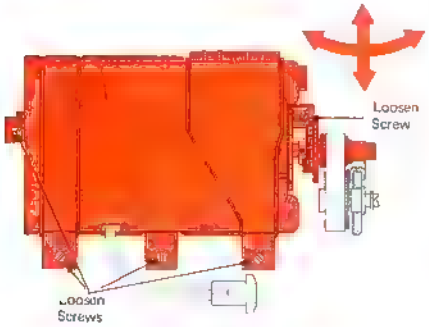
1. *Motor Clutch Pawls* Form the lug on the clutch hub for a clearance of .010"-.020" (0,25-0,51mm) between the pawls and the pulley ratchet when the pulley is manually rotated



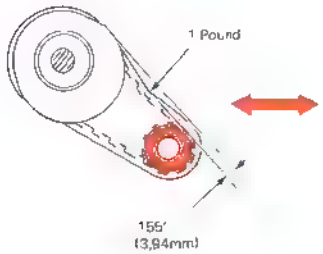
2. *Motor Pulley* Adjust the hub assembly and grip clip left-to-right so that the belt rides fully on both pulleys. Maintain .002"-.006" (0,05-0,15mm) pulley end play with the grip clip.



3. *Motor Position* — Adjust the position of the motor so that the belt operates centrally on both pulleys and, so that the drive belt will deflect .155" (3,94mm) when one pound (454g) pressure is applied to the belt between the pulleys.

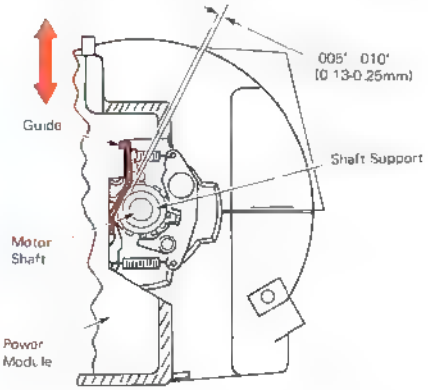


(Top View)

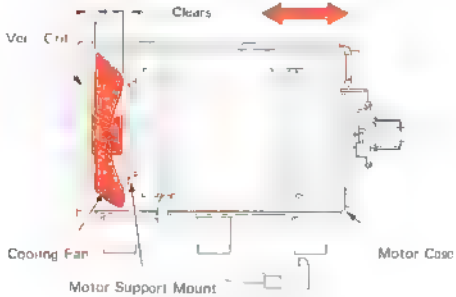


(Right Side View)

4. *Motor Shaft Support* — Adjust the shaft support guide up or down for .005"-.010" (0,13-0,25mm) clearance from the shaft support.



5. *Motor Fan* — Position the cooling fan left or right on the shaft to clear the vent grill and motor support mount with the motor mounted in the bottom of the case



KEYBOARD CLUTCH OPERATIONAL THEORY

The keyboard clutch is located on the left of the power module upper shaft and controls the keyboard drive cam (Figure 1). The cam provides drive motion for the keyboard when a keybutton has been depressed. The keyboard clutch is a spring clutch with a sleeve to control the spring

The upper shaft in the power module rotates continuously while the motor is turning (Figure 2). A clutch latch engages the latch surface on the clutch sleeve and prevents the clutch and drive cam from rotating.

When a keybutton on the keyboard is depressed, the release link pivots the clutch latch away from the sleeve. This allows the clutch to rotate the keyboard drive cam. As the cam rotates, the keyboard drive cam follower rotates on a pivot shaft and supplies motion to the drive link and the filter bail in the keyboard. The action of the filter bail is discussed in the Keyboard section

A check pawl is mounted on the pivot shaft and is spring loaded toward the cam. The lower end of the check pawl contacts an adjusting screw on the clutch latch as the check pawl is driven by the high surface of a track on the cam. The check pawl has three functions. It engages the clutch latch with the sleeve, it restores the keyboard release latch and at the completion of a cycle, it holds the keyboard clutch disengaged

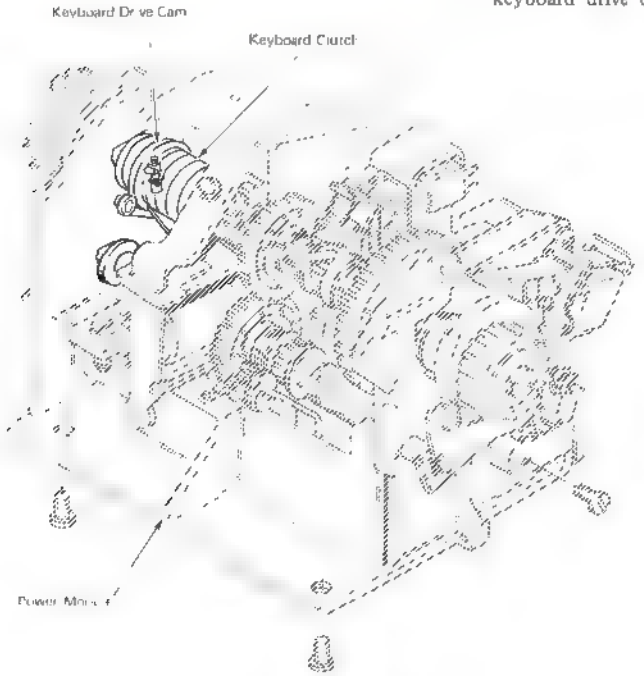


Figure 1 – Keyboard Clutch

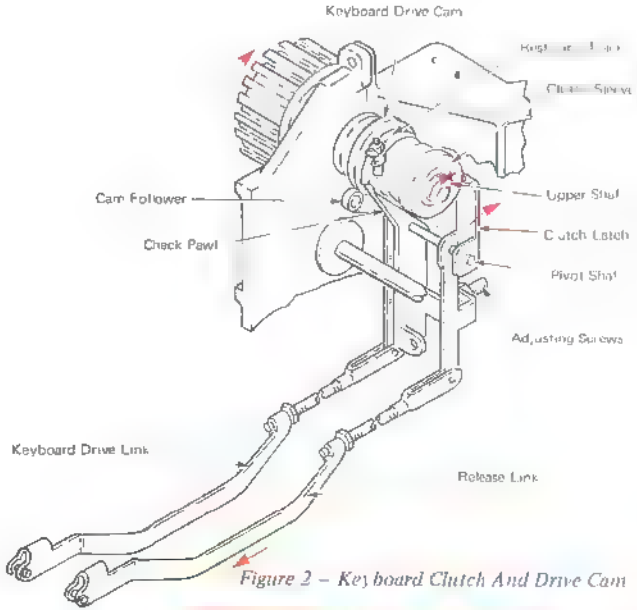


Figure 2 – Keyboard Clutch And Drive Cam

After the clutch sleeve contacts the clutch latch (Figure 3), the momentum of the cam and clutch spring rotates the cam until the check pawl engages the check latch surface of the cam. When the check pawl and the clutch latch are engaged, the clutch spring is held expanded and the clutch arbor rotates without driving.

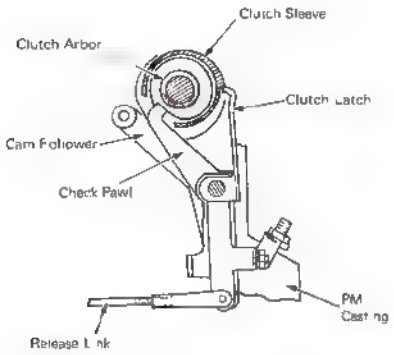
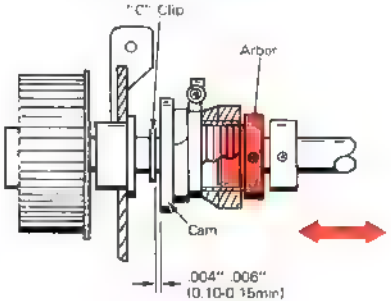


Figure 3 – Clutch Disengage

KEYBOARD CLUTCH ADJUSTMENTS

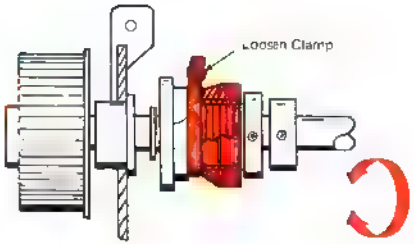
NOTE: Adjustments 1 and 2 of the print shaft cycle clutch must be correct before making the keyboard clutch adjustments. These two adjustments control the lateral position of the upper shaft.

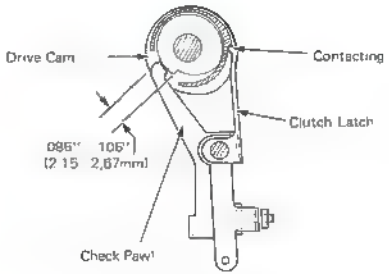
1. *Keyboard Clutch Arbor* – Adjust the arbor left or right for clearance of .004"-.006" (0,10-0,15mm) between the cam and the "C" clip on the upper shaft.



2. *Keyboard Clutch Spring* – Adjust the clutch spring on the keyboard drive cam so that the clutch slips when the check pawl is .085"-.105" (2,16-2,67mm) from the notch on the drive cam, when the upper shaft is rotated by hand. To make this adjustment loosen the clamp on the clutch spring and rotate the spring.

NOTE: After loosening the clamp, ensure that adjustment no. 3 is correct, then tighten the clamp.

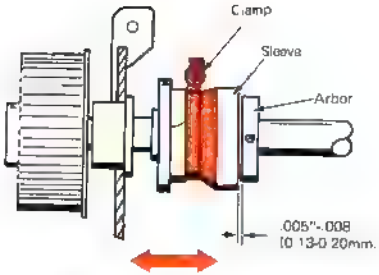




(Right Side View)

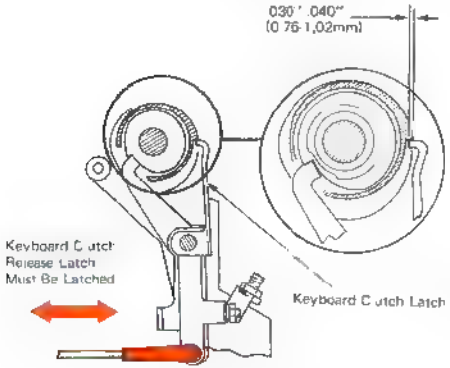
3. *Keyboard Clutch Sleeve* – Adjust the clutch spring clamp left or right for a clearance of .005"-.008" (0,13-0,20mm) between the sleeve and the arbor.

NOTE: Ensure that adjustment no. 2 is correct before tightening the clamp when making this adjustment.



4. *Keyboard Clutch Latch* Adjust the clutch release link so that the latch engages the sleeve by .030"-.040" (0,76-1,02mm).

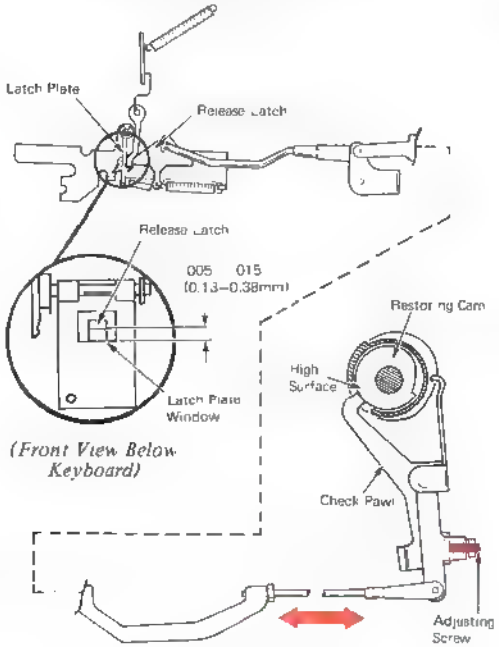
When checking this adjustment, the keyboard clutch release latch must be at rest in the latch plate window. The clutch latch should be lightly held toward the rear to remove any lost motion in the link.



(Right Side View)

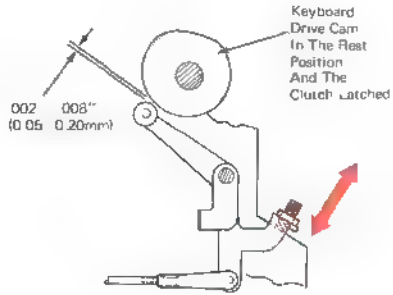
5. *Release Latch Restore* - Turn the adjusting screw in or out so that the release latch has .005" .015" (0,13-0,38mm) overthrow past the edge of the latch plate window. Check this adjustment as the check pawl passes the high surface of the restoring cam surface on the keyboard drive cam.

NOTE: The keyboard clutch latch adjustment (adjustment 4) must be correct before checking this adjustment.



(Right Side View)

6. *Keyboard Drive Cam Follower* – Adjust the cam follower stop screw in or out for a clearance of .002"-.008" (0,05-0,20mm) between the cam follower roller and the drive cam. The cam should be in the rest position with the clutch latched.



(Right Side View)

PRINT SHAFT CYCLE CLUTCH
OPERATIONAL THEORY

The print shaft cycle clutch is located outside the machine side frame on the upper shaft of the power module (Figure 1)

The clutch is released by the cycle clutch magnet and rotates the cycle clutch pulley 360 degrees each cycle. The print shaft drive belt transfers motion to the print shaft

The clutch arbor is attached by setscrews to the upper shaft. The clutch spring is clamped to the cycle clutch pulley by a screw and wedge inside the cycle clutch restore cam (Figure 2).

The clutch spring is controlled by a sleeve, located around the spring and supported between the clutch arbor and the restore cam

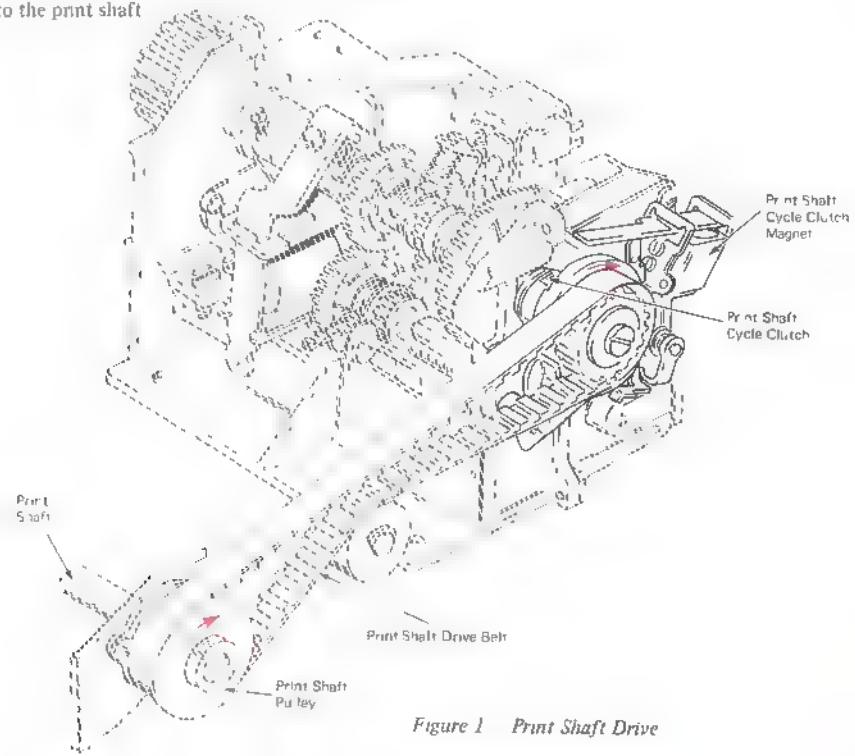
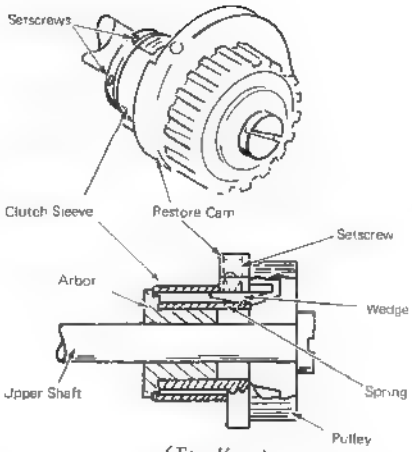


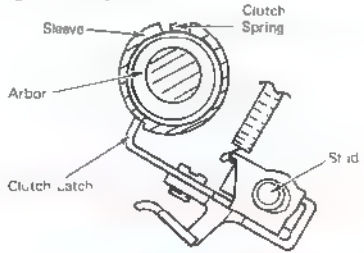
Figure 1 Print Shaft Drive



(Top View)

Figure 2 Print Shaft Cycle Clutch

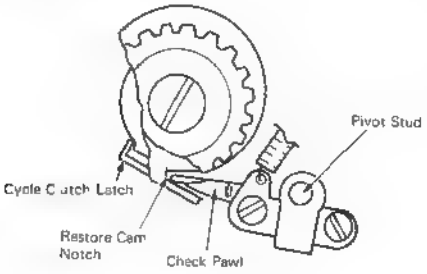
The cycle clutch is held disengaged by the cycle clutch latch which pivots on a stud (Figure 3) The forward end of the latch engages the sleeve which controls the end of the clutch spring The latch is spring loaded up at front.



(Right Side View)

Figure 3 – Cycle Clutch Latch

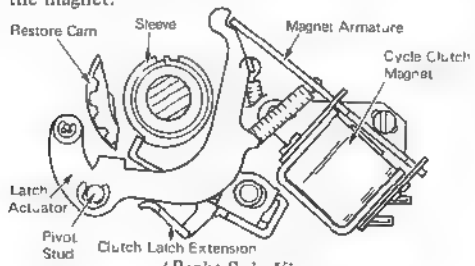
The check pawl also pivots on the stud (Figure 4). The check pawl is spring loaded up at the front and engages a notch on the restore cam. At rest, the cycle clutch is held between the cycle clutch latch and the check pawl.



(Right Side View)
Figure 4 – Cycle Clutch Check Pawl

The latch actuator pivots on a stud (Figure 5) It releases the cycle clutch latch when the cycle clutch magnet is energized.

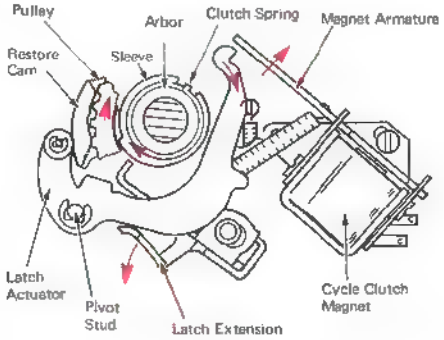
The actuator is spring loaded down at the rear and is latched on the magnet armature, at rest The lower edge of the actuator contacts the clutch latch extension when the actuator is released by the magnet.



(Right Side View)
Figure 5 Cycle Clutch Latch Actuator

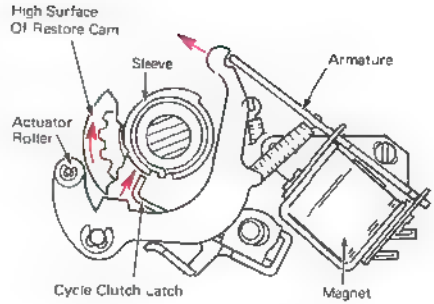
PRINT SHAFT CYCLE CLUTCH OPERATION

When the cycle clutch magnet is energized, the actuator is released and is pivoted top-to-rear by spring tension (Figure 6) This causes a downward movement of the latch extension and the cycle clutch latch As the latch moves down, it disengages the sleeve The clutch spring then engages the arbor and the clutch pulley is rotated.



(Right Side View)
Figure 6 – Cycle Clutch Engaged

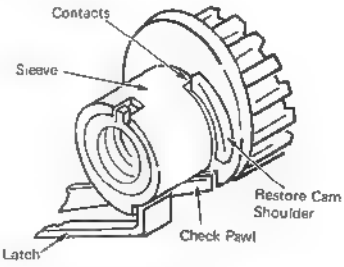
The magnet is deenergized when the print shaft has rotated approximately 85 degrees As the clutch rotates, the restore cam contacts the roller on the actuator (Figure 7). The actuator pivots top-to-front and the magnet armature latches the actuator. As the actuator is restored, the cycle clutch latch is allowed to pivot toward the sleeve.



(Right Side View)
Figure 7 – Actuator Restore

As the sleeve rotates with the clutch, it contacts the latch (Figure 8) The momentum of the pulley, restore cam and print shaft continue to rotate the clutch until the sleeve has opened the clutch spring. The pulley stops rotating when the restore cam shoulders contact the sleeve

At the same time, the check pawl engages the restore cam notch. This holds the clutch in the rest position



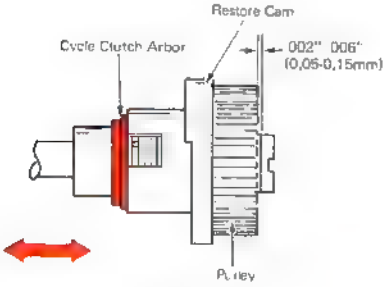
(Left Front View)
Figure 8 - Clutch Disengaged

PRINT SHAFT CYCLE CLUTCH ADJUSTMENTS

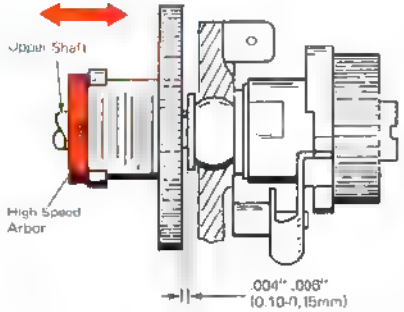
1 *Cycle Clutch Arbor* – Adjust the arbor for a clearance of .002" - .006" (0,05-0,15mm) between the arbor and the pulley

This clearance may be checked between the pulley and the head of the pulley retaining screw. Ensure that the left-to-right position of the restore cam clutch sleeve does not affect this adjustment.

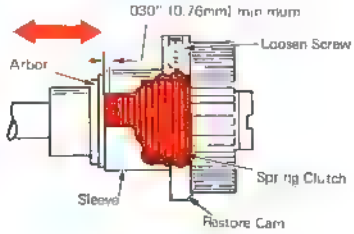
NOTE: The arbor has two setscrews. Make sure all end play is removed between the cycle clutch and pulley arbors when making this adjustment.



2 *Upper Shaft* – Adjust the high speed arbor for .004" - .006" (0,10-0,15mm) end clearance of the upper shaft.



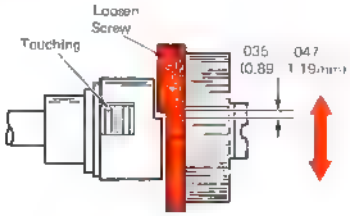
3 *Print Shaft Cycle Clutch Spring* – Position the spring clutch left or right under the restore cam so the left end of the spring clutch clears the arbor by a minimum of .030" (0,76mm).



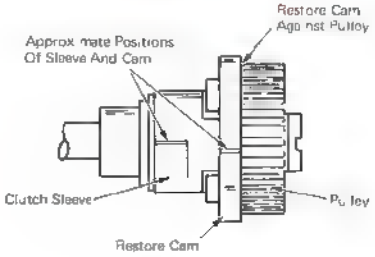
4 *Restore Cam* – Adjust the restore cam rotationally for a clearance of .035" - .047" (0,89-1,19mm) between the sleeve and the cam shoulder.

The clutch spring must be closed on the arbor when checking this adjustment. Loosen the screw in the restore cam to make this adjustment. Ensure that the cam is against the pulley before tightening the screw.

NOTE: The sleeve must be engaged between the restore cam shoulders so that the latch surface on the sleeve almost aligns with the check pawl notch on the cam.



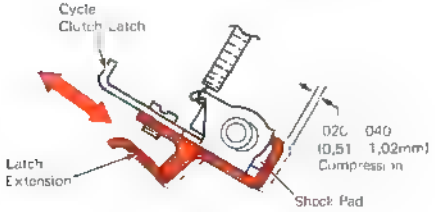
(Top View)



(Bottom View)

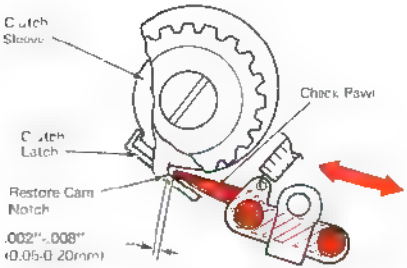
5. *Cycle Clutch Latch* – Adjust the latch extension for .020"-.040" (0,51-1,02mm) compression of the shock pad.

To make this adjustment, loosen the binding screw and slide the extension toward the front until it contacts the pad, then .020"-.040" (0,51-1,02mm) further



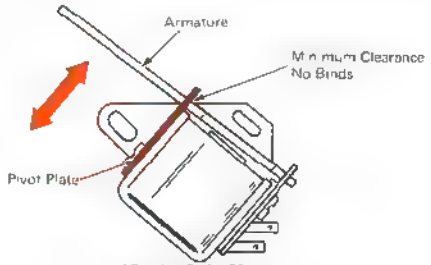
(Right Side View)

6. *Check Pawl* – Adjust the check pawl for .002"-.008" (0.05-0,20mm) rotational motion of the restore cam, with the sleeve engaged with the latch and the check pawl in the restore cam notch



(Right Side View)

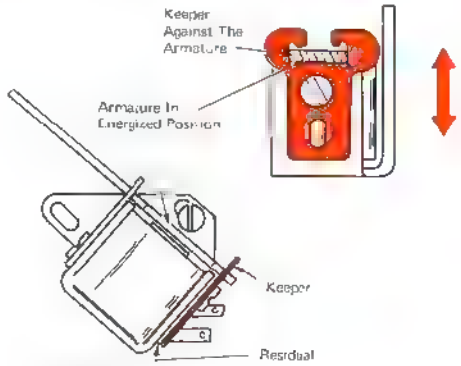
7. *Cycle Clutch Magnet Pivot Plate* Adjust the pivot plate up or down so that the armature pivots with minimum clearance and no binds



(Right Side View)

8. *Cycle Clutch Magnet* Adjust the armature keeper up or down so that the bottom edge of the slot is flush with the residua.

To make this adjustment, the armature may be held in the energized position and the keeper adjusted up to contact the armature

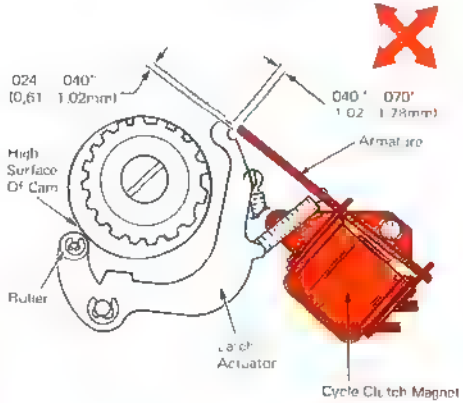


(Right Side View)

9. *Cycle Clutch Magnet Position* Adjust the position of the cycle clutch magnet for two conditions

a. An overthrow of .040"-.070" (1,02-1,78mm) between the latch actuator and the armature, with the actuator roller on the high surface of the cam

b. .024"-.040" (0,61-1,02mm) engagement between the actuator and the armature



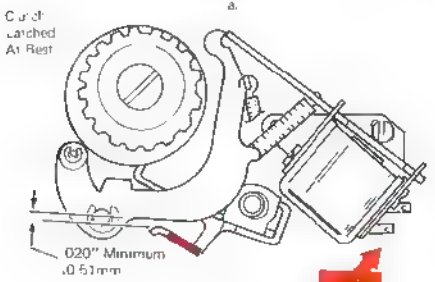
(Right Side View)

10. *Cycle Clutch Latch Extension* Form the extension up or down so that

a. It clears the latch actuator by a minimum of 020" (0,51mm). The clutch must be latched at rest when checking this adjustment

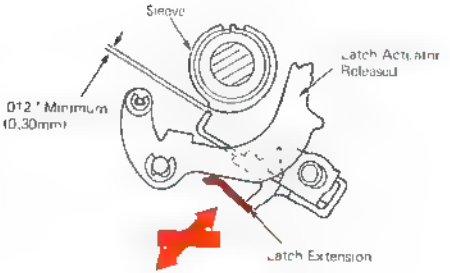
b. The clutch latch clears the sleeve by a minimum of 012" (0,30mm) when the latch actuator is released

a.



(Right Side View)

b.



(Right Side View)

LEADSCREW DRIVE OPERATIONAL THEORY

The leadscrew drive consists of clutches, gears and pulleys (Figure 1) Magnets control the clutches and a leadscrew drive belt drives the leadscrew.

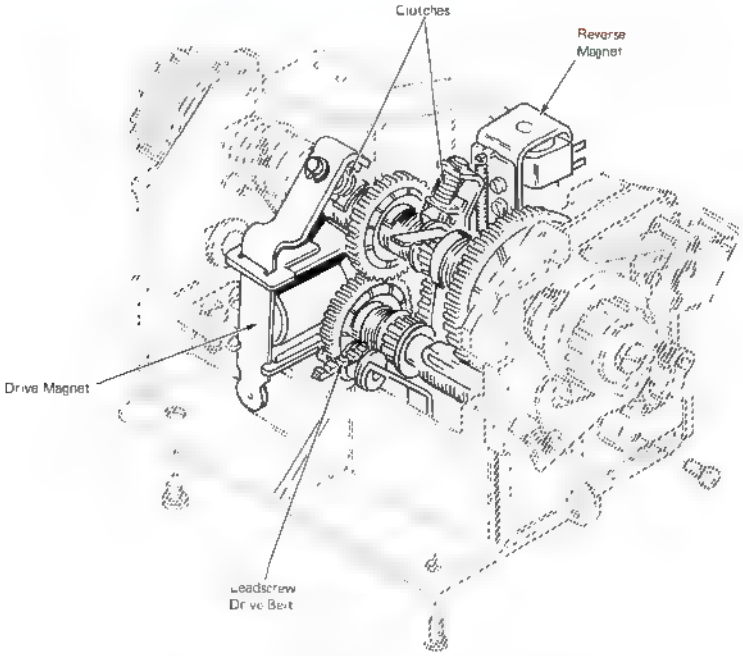


Figure 1 Leadscrew Drive

The clutches in the leadscrew drive are spring clutches (Figure 2). They are engaged to drive by electromagnets. The magnet armatures have clutch shoes which apply pressure to the outside of the clutch springs when the magnets are energized This causes the spring of the clutch to tighten on the arbor and to transmit drive motion

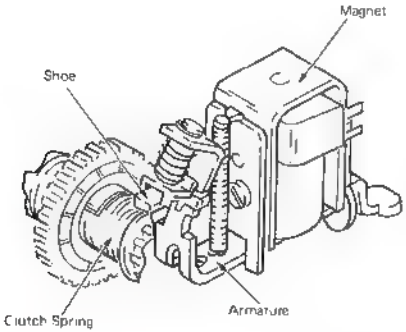


Figure 2 – Spring Clutch And Magnet

The drive magnet is mounted on the front power module casting (Figure 3). The other magnets in the leadscrew drive are the reverse magnet, forward magnet, and high speed magnet. These three magnets are mounted on the rear casting.

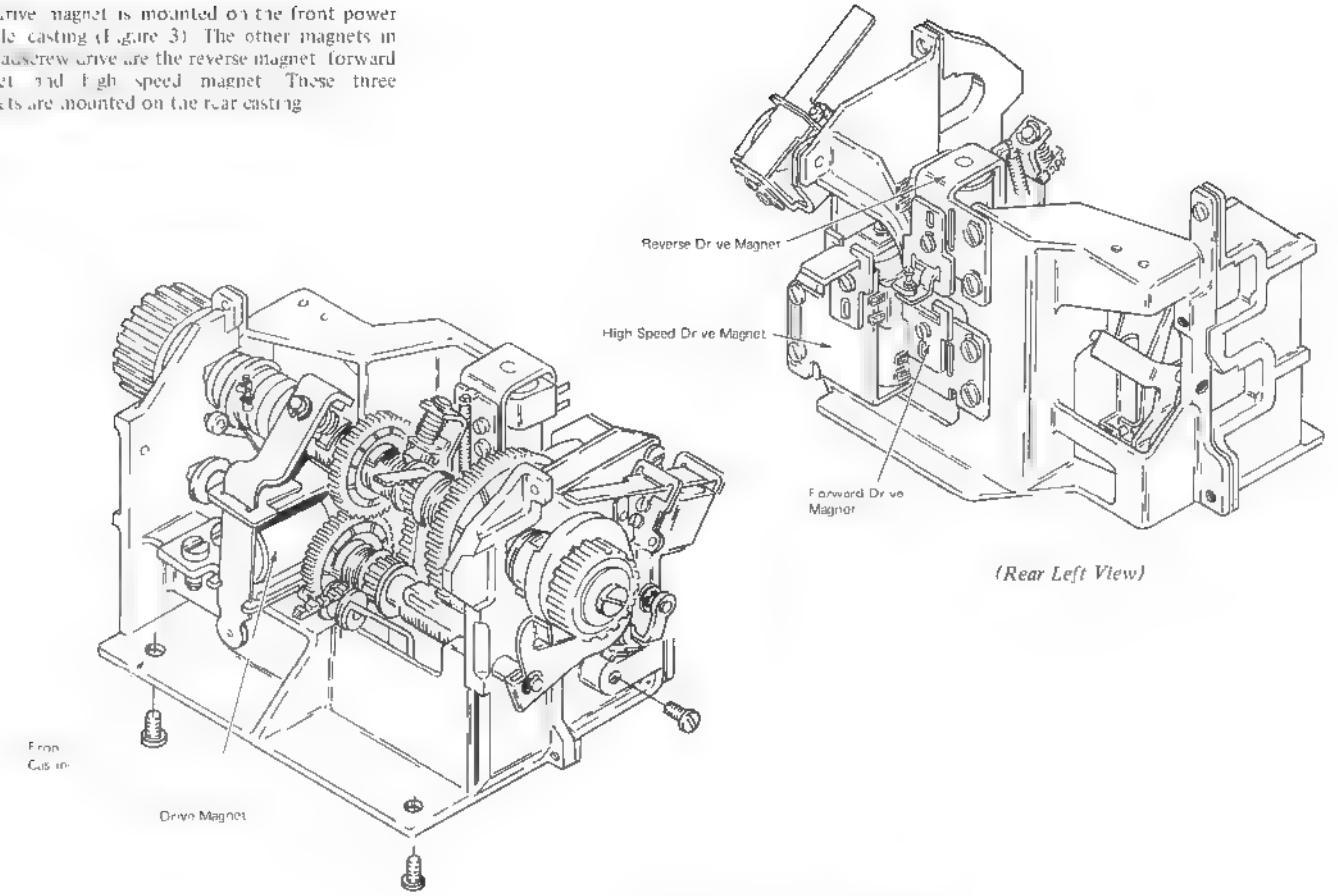


Figure 3 Leadscrew Drive Magnets

LEADSCREW DRIVE OPERATION

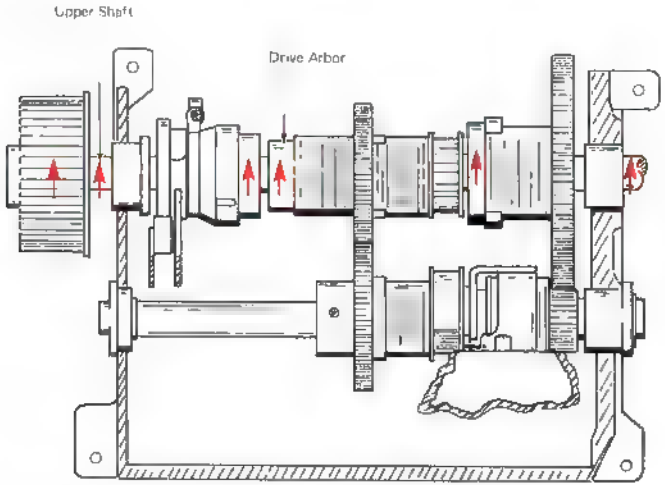
With the machine motor turning and no operations started, no magnets are energized and all the clutches are disengaged. The motor rotates the upper shaft of the power module continuously (Figure 4).

The drive arbor is attached by setscrews to the upper shaft so it also rotates. No gears or clutches are being driven, although some may rotate slowly due to small amounts of friction in the clutches.

REVERSE DRIVE

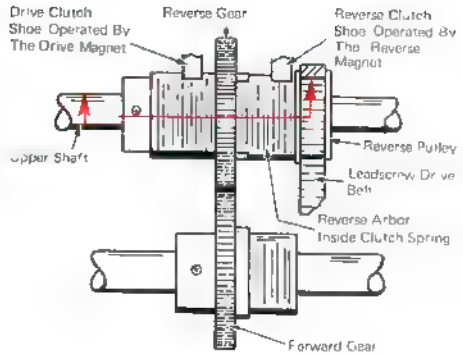
During reverse drive, the drive magnet is energized and engages the drive clutch (Figure 5). This rotates the reverse gear and arbor. The reverse drive magnet is also energized and engages the reverse clutch. This causes the reverse pulley to rotate the leadscrew drive belt, top-to-rear.

As the reverse gear rotates, it drives the forward gear and the lower shaft. The forward gear and lower shaft are not used at this time.



(Front View)

Figure 4 - Power Module Idle

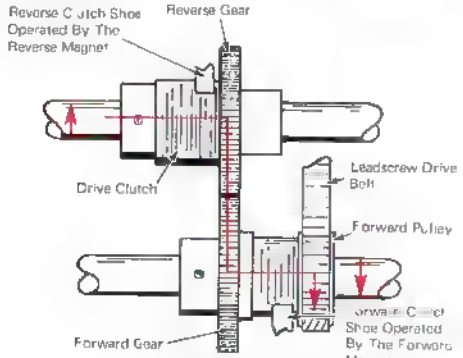


(Front View)

Figure 5 - Reverse Drive

FORWARD DRIVE

During a forward drive operation, the drive magnet is energized and engages the drive clutch (Figure 6). The reverse gear rotates and drives the forward gear. The forward magnet is also energized. This causes the forward pulley to rotate the leadscrew drive belt top-to-front.

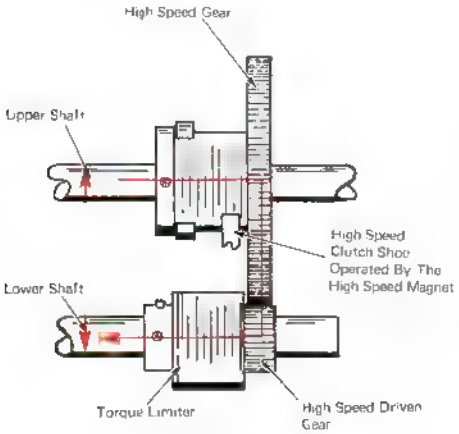


(Front View)

Figure 6 - Forward Drive

HIGH SPEED DRIVE

During high speed drive the high speed magnet is energized and engages the high speed clutch (Figure 7) This causes the high speed gear, the high speed driven gear and the high speed torque limiter to rotate the lower shaft at high speed The high speed torque limiter is provided to slip when the drive clutch and the high speed clutch are driving at the same time. This only takes place for very short periods as the leadscrew drive changes from one drive condition to another (e g., high speed forward to low speed forward)

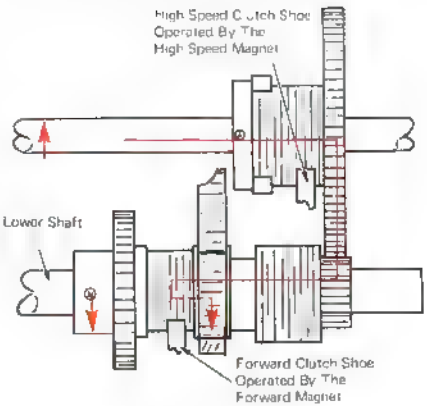


(Front View)

Figure 7 – High Speed Drive

HIGH SPEED FORWARD

When the lower shaft is rotating at high speed and the forward magnet is energized, the forward clutch drives the forward pulley and leadscrew belt at high speed (Figure 8)



(Front View)

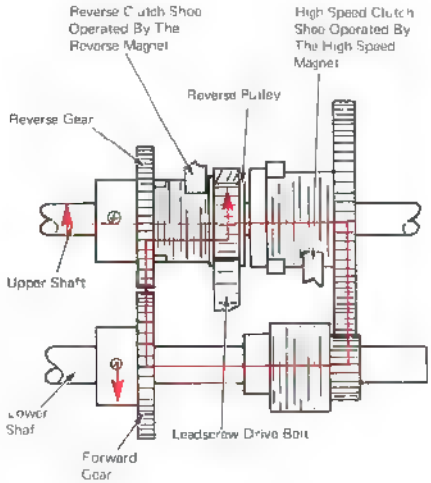
Figure 8 – High Speed Forward

HIGH SPEED REVERSE

When the lower shaft is rotating at high speed, the reverse gear is rotated at high speed by the forward gear (Figure 9) When the reverse magnet is energized, the reverse clutch will rotate the reverse pulley and the leadscrew drive belt at high speed.

In this condition the reverse gear and clutch rotate on the upper shaft in the same direction, but faster than the shaft

The leadscrew drive is used when left or right motion of the carrier is required The escapement mechanism and the leadscrew drive mechanism operate together to move the carrier during space, tabulation, backspace and carrier return The leadscrew is released first (discussed in the Escapement section) and then the required drive magnets are energized If the carrier has to move more than one and one-half inches in either direction, the high speed drive magnet and the forward or reverse magnets are energized. The carrier then moves at high speed When the carrier is one and one-half inches from the position at which it is required to stop, the high speed magnet is de-energized and the drive magnet is energized The carrier then continues to move at low speed until the drive magnet is de-energized and the escapement paw is allowed to engage the ratchet

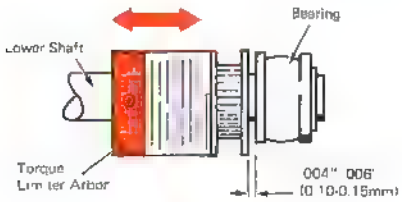


(Front View)

Figure 9 – High Speed Reverse

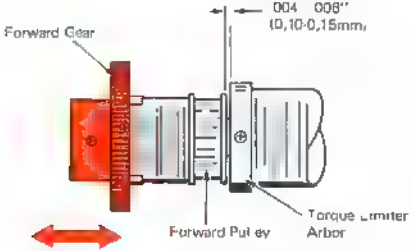
LEADSCREW DRIVE ADJUSTMENT

1. *Lower Shaft* – Adjust the torque limiter arbor left or right for .004"-.006" (0,10-0,15mm) end clearance of the lower shaft



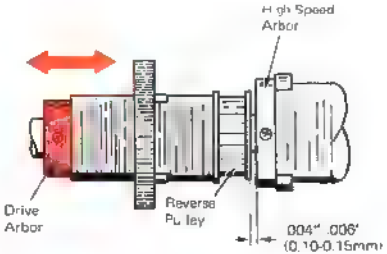
(Front View)

2. *Forward Clutch* – Adjust the forward gear left or right for a clearance of .004"-.006" (0,10-0,15mm) between the forward pulley and the torque limiter arbor



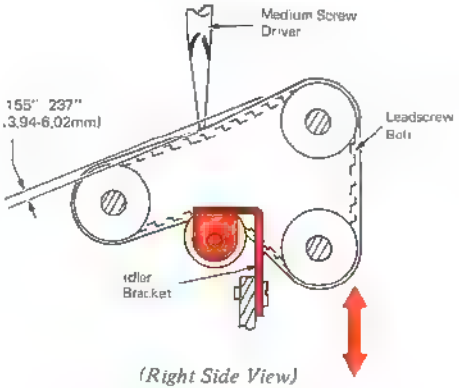
(Front View)

3. *Drive Arbor* – Adjust the drive arbor for .004"-.006" (0,10-0,15mm) clearance between the reverse pulley and the high speed arbor.



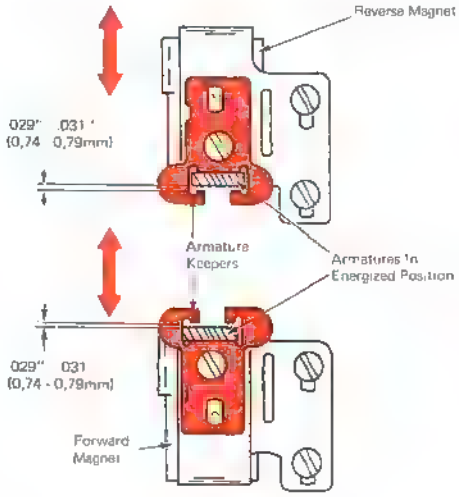
(Front View)

4. *Leadscrew Belt* – Adjust the belt idler bracket up or down for .155"-.237" (3,94-6,02mm) deflection of the belt when a medium screwdriver is allowed to rest on the belt.



(Right Side View)

5. *Reverse And Forward Magnets* – Adjust the armature keepers up or down for .029"-.031" (0,74-0,79mm) clearance to the armatures. The armature should be in the energized position when checking these adjustments.

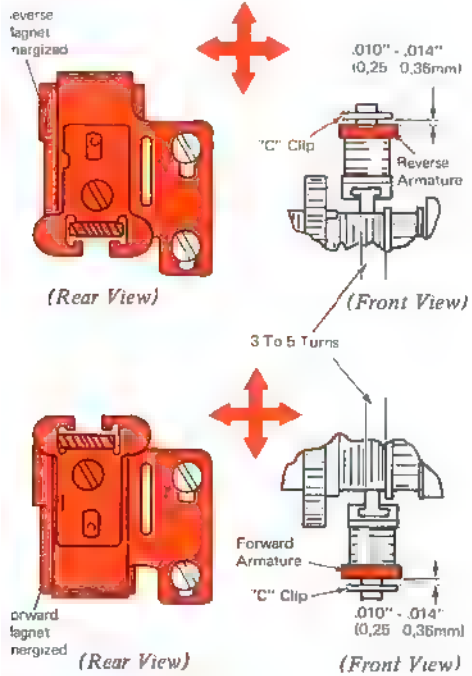


(Rear View)

6. *Reverse And Forward Magnet Position* Adjust the magnets up or down for .010"-.014" (0,25-0,36mm) clearance between the "C" clip and the armature

The armatures must be in the energized position when checking this adjustment, with the shoes against the clutch springs

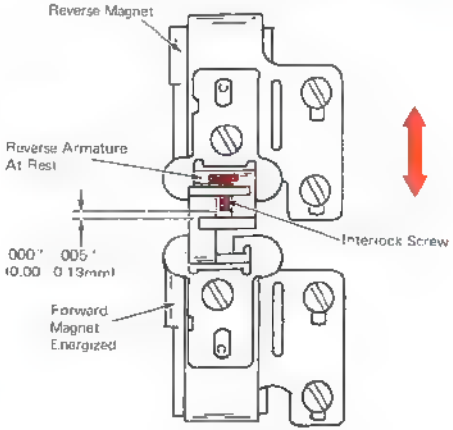
Ensure that the shoe contacts 3 to 5 turns of the clutch spring before tightening the magnet mounting screws.



(Rear View) *(Front View)*

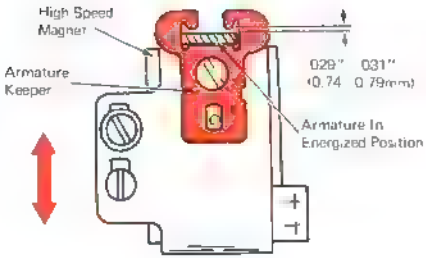
(Rear View) *(Front View)*

7. *Magnet Interlock* Adjust the interlock screw up or down for 0.00"-0.05" (0.00-0.13mm) clearance to the reverse armature. The forward armature must be in the energized position when checking this adjustment, with the reverse armature at rest



(Rear View)

8. *High Speed Magnet* – Adjust the armature keeper up or down for .029"-.031" (0,74-0,79mm) clearance to the armature. The armature should be in the energized position when checking this adjustment.



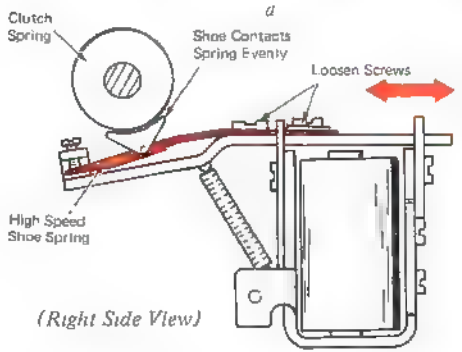
(Rear View)

9. *High Speed Shoe Position* Adjust the shoe spring for two conditions

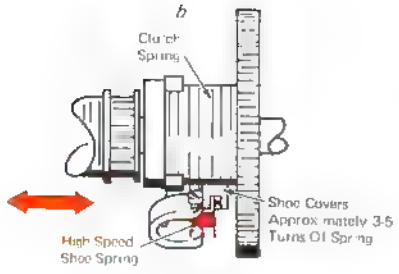
a. Front or rear, to center the shoe on the clutch spring.

b. Left or right, so that the shoe contacts 3 to 5 turns of the spring

NOTE: This adjustment may be affected by adjustment 10 (high speed magnet position).



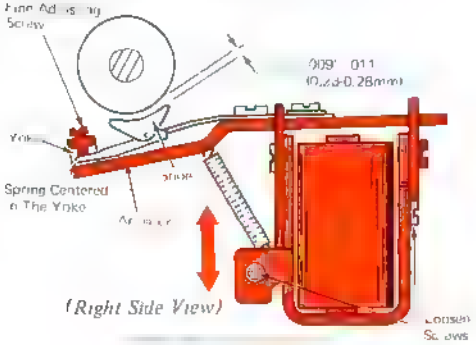
(Right Side View)



(Front View)

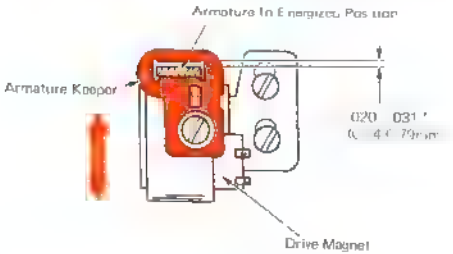
10. *High Speed Magnet Position* Adjust the magnet up or down for a clearance of .009" .011" (0.23-0.28mm) between the shoe and the clutch spring. The shoe spring should be in the center position in the yoke at the front of the armature before this adjustment is changed. The shoe spring fine adjusting screw may be used to refine the shoe clearance after the magnet position has been adjusted.

NOTE This adjustment may affect adjustment 9 (high speed shoe position).



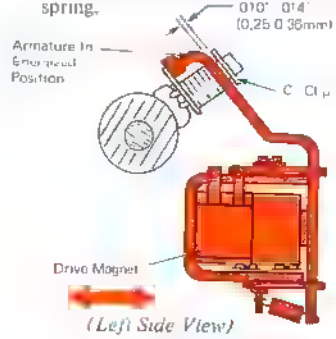
(Right Side View)

11. *Drive Magnet* Adjust the armature keeper back or foward for .029"-.031" (0.74-0,79mm) clearance to the armature. The armature should be in the energized position when checking this adjustment.



(Top View)

12. *Drive Magnet Position* Adjust the magnet back or forward for .010" .014" (0.25-0.36mm) clearance between the "C" clip and the armature. The armature must be in the energized position when checking this adjustment, with the shoe against the clutch spring.



(Left Side View)

The keyboard is the command unit of the machine. It provides a code for each character and function keybutton depressed. The codes are processed by the logic board which then starts the required machine operation (Figure 1).

The keyboard is separated into two operations for detailed discussion: Character Keylever Operation and Functional Keylever Operation. The Character Keylever Operation describes the complete keyboard selection mechanism. The Functional Keylever Operation describes the details of the functional keylevers which differ from those of the character keylevers.

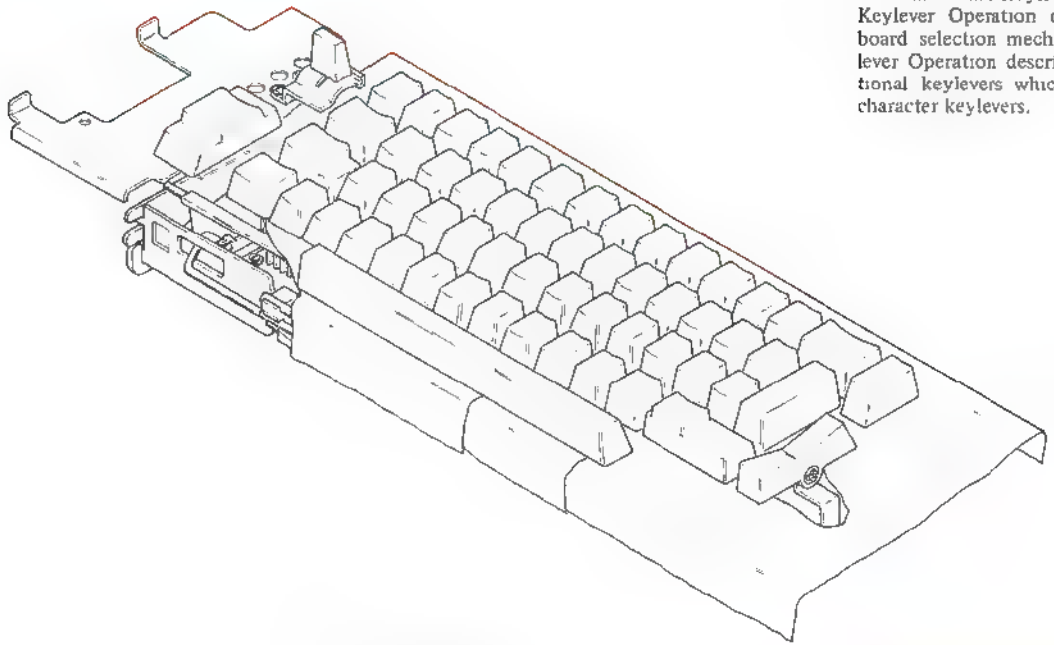


Figure 1 – Keyboard

KEYBOARD ASSEMBLIES

The keyboard may be easily separated into three assemblies, top section, center section and bottom section (Figure 2).

The top assembly consists of the keybuttons and keylevers

The center assembly consists of the selection interposers, the filter bail and the compensator tube

The bottom assembly consists of the selection bails, the keyboard release mechanism and the bail reed switches

The logic board is mounted under the bottom assembly

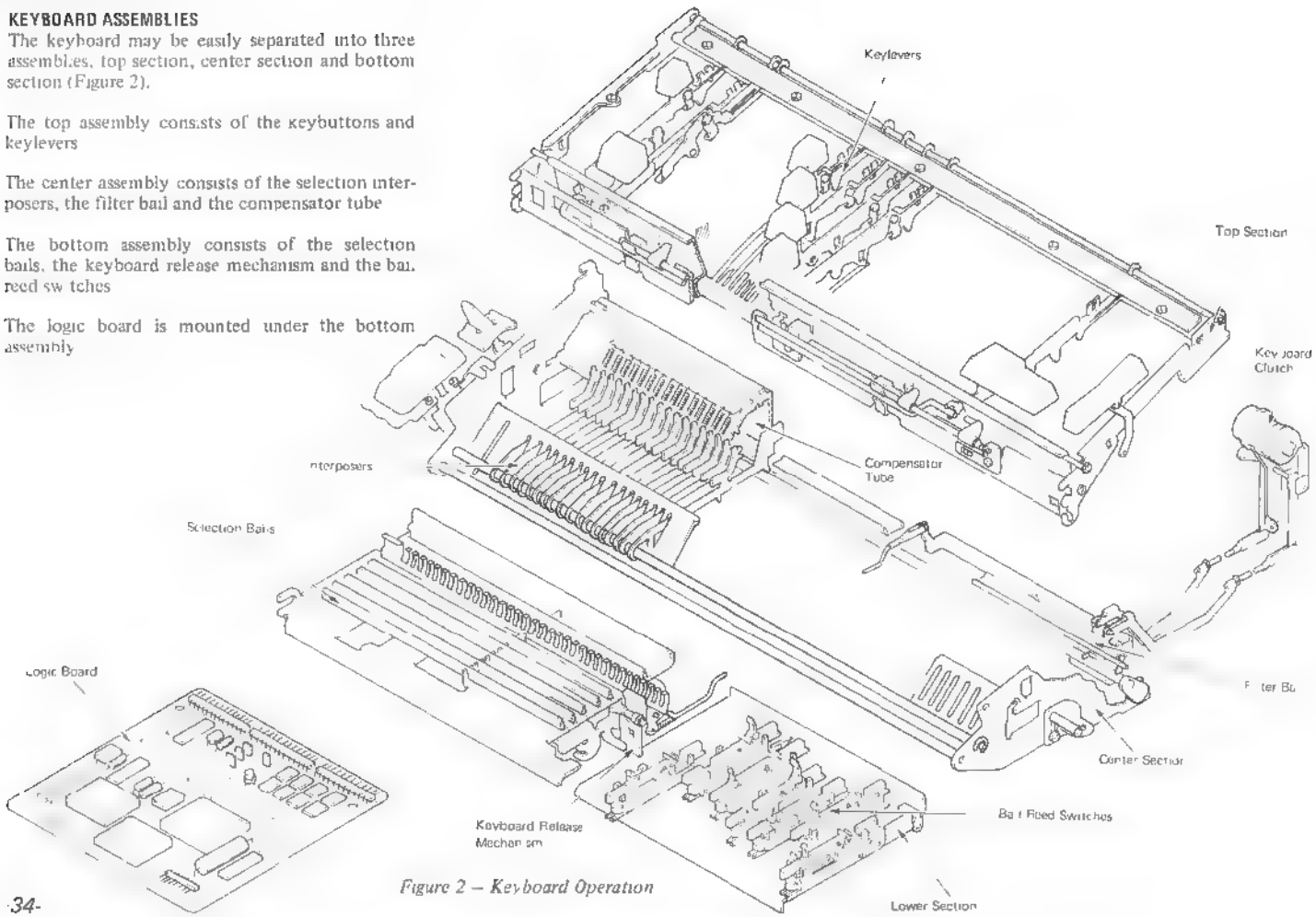


Figure 2 – Keyboard Operation

CHARACTER KEYLEVER OPERATION

The keyboard has a keylever for each character. The keylevers pivot on a fulcrum rod at the rear of the keyboard (Figure 3). The up and down motion of the keylevers is limited by the front keylever guide comb.

The keylevers are held in the upward position by leaf springs under the keylevers. Spring tension is applied to the four rows of keylevers by leaf springs of different widths. The distance between the keylever fulcrum point and key buttons is different on each row. The difference in spring tension allows similar operating force required to depress keybuttons in each row.

A keylever pawl is attached to each keylever by a shouldered rivet (Figure 4). This pawl is spring loaded in position to contact the top of an interposer. When the keylever is depressed, the pawl depresses a selection interposer. If the keylever is held down during a keyboard operation, the rear edge of the interposer lug will strike the keylever pawl as the interposer restores to rest.

The keylever pawl will be deflected to the rear until the keybutton is released. When the keybutton is released the keylever pawl resets above the top of the interposer. This arrangement ensures a single operation, even if the keylever is held depressed.

SELECTION INTERPOSER

The selection interposers pivot on a large fulcrum rod at the front and are spring loaded upward and to the rear by extension springs (Figure 5). The top of each spring is welded to a spring anchor plate. The lower end of each spring is hooked into an interposer latch. The latches are assembled on the interposers. The front and rear of the interposers are supported by guide combs. The interposers are allowed to move front to rear in both guide combs and vertically in the rear guide comb.

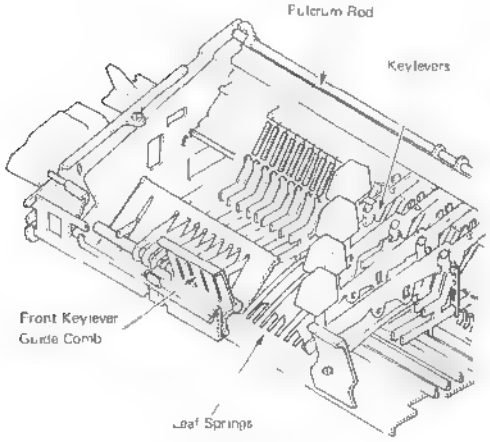
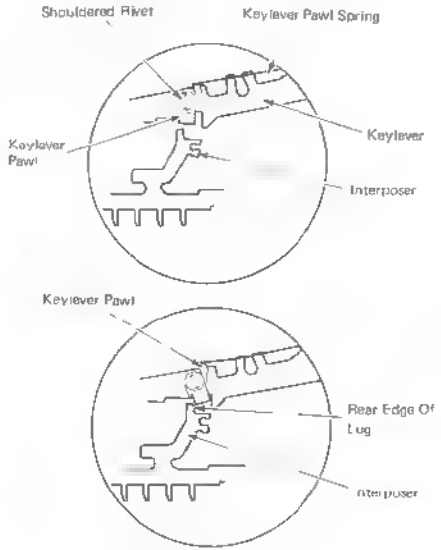


Figure 3 Character Keylever Operation



(Right Side View)

Figure 4 – Keylever Pawl

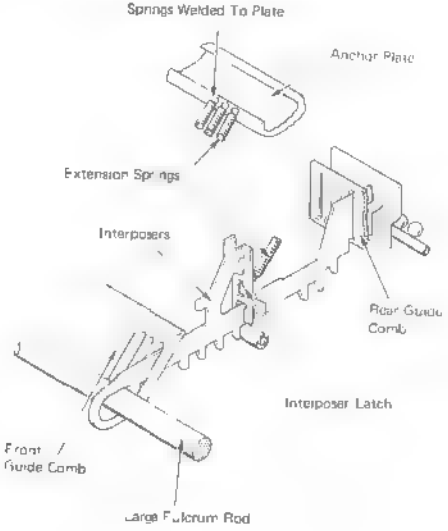
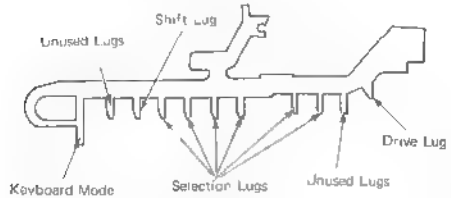


Figure 5 Selection Interposer

Each interposer has four lugs common to all other keyboard interposers. The four common lugs are the interposer drive lug, two unused lugs and the keyboard mode release lug (Figure 6)

The filter bail drive lug engages the filter bail to transfer the keyboard clutch motion to the interposer. The keyboard mode release lug is only used on the lower case interposer and is discussed in Shift Keylever Operation

Each selection interposer has a different combination of selection lugs The lugs on an interposer will operate a combination of selection bails during a selection operation. The operation of the selection bails is discussed under Selection Bails The upper case interposer has a shift lug in front of the selection lugs. The function of this lug is discussed in the Shift Keylever section



(Right Side View)

Figure 6 – Interposer

When a keybutton is depressed, the keylever pawl pushes the interposer down. An interposer latch is used to ensure that the interposer remains down until a selection is completed (Figure 7) The interposer latches are mounted on the rear of the interposers and are spring loaded toward the rear. The latches have a square window which latches on the interposer latch plate. In the latched position the interposer drive lug will be in the path of the filter bail forward motion.

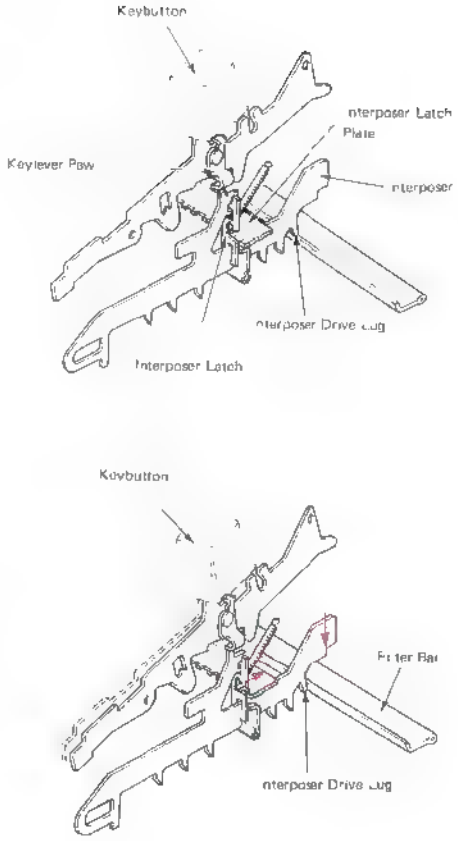


Figure 7 – Keylever And Interposer Operation

There are two special interposers on the right side of the keyboard (Figure 8). One is called the Stop Interposer and the other the Reverse Interposer. The Stop Interposer has no motion and serves as the selection bail stop. The Reverse Interposer is driven by the filter bail just ahead of the selection interposers. This prevents the selection bails from unwanted bounce. As the reverse interposer restores, it restores all selected bails. The Reverse Interposer is easily identified by the extension on the top which is a spring anchor

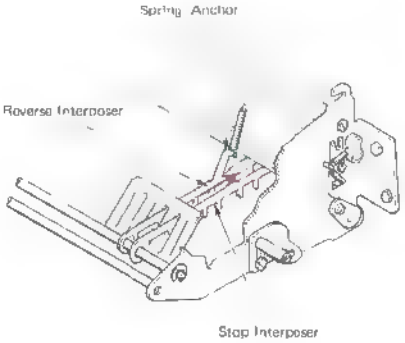


Figure 8 Stop And Reverse Interposers

KEYBOARD DRIVE CAM

The keyboard drive cam in the power module provides motion to drive the filter bail. The operation of the keyboard drive cam and clutch is discussed in the Power Module Section.

KEYBOARD CLUTCH RELEASE

The keyboard clutch is released by a release mechanism in the keyboard. The release mechanism consists of a release bail mounted behind the interposer latches and a release latch under the keyboard bottom plate (Figure 9). The release latch mechanism is attached by a link assembly to the keyboard clutch latch.

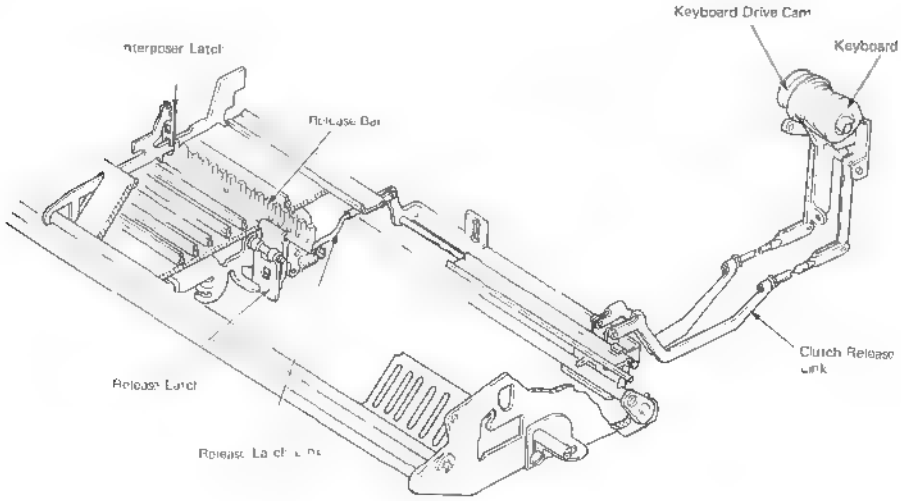


Figure 9 – Keyboard Clutch Release

The release bail pivots between the vertical sides of the bottom plate like the selection bails (Figure 10). A bail lever on the release bar extends down through the keyboard bottom plate.

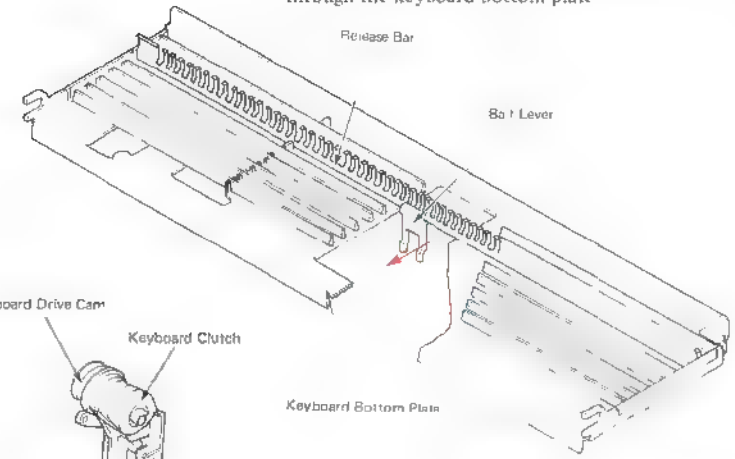
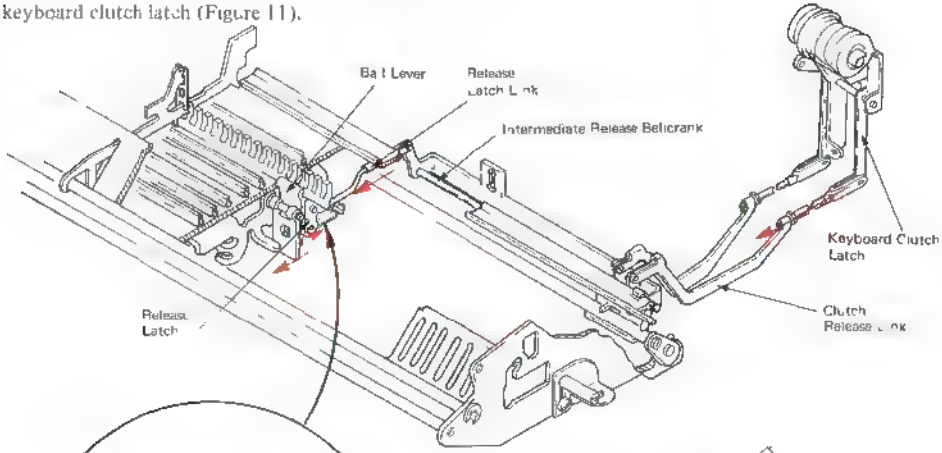


Figure 10 Release Bail

The lever contacts the back of a lightly spring loaded latch plate. A square window in the latch plate engages a spring loaded release latch. The release latch is connected to the intermediate release bellcrank by a link and clevis. A mounting bracket and shaft allows the intermediate release bellcrank to pivot. The clutch release link connects the intermediate release bellcrank and the keyboard clutch latch (Figure 11).



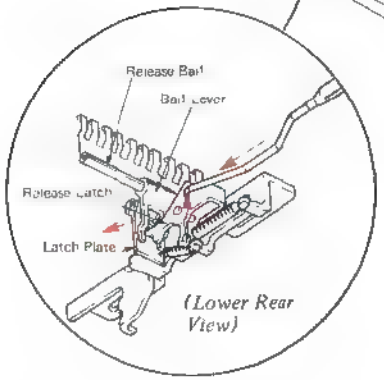


Figure 11 Release Latch

As an interposer is latched down, the interposer latch comes in contact with the release bail and pivots it to the rear. The bail lever pivots forward and disengages the latch plate from the release latch (Figure 12). Spring tension then rotates the release latch on a pivot stud. This motion is transferred by a link, the intermediate bellcrank, the release link and the keyboard clutch latch to release the clutch.

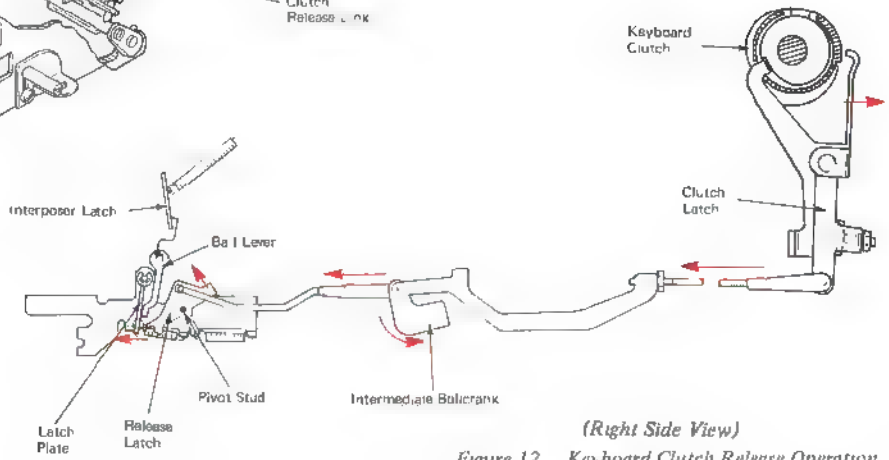
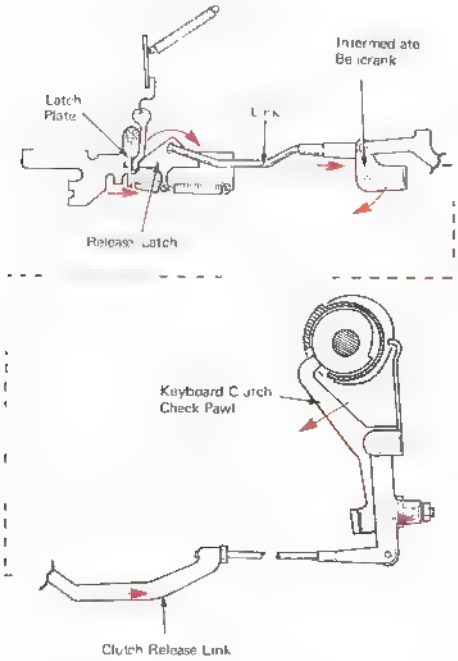


Figure 12 Keyboard Clutch Release Operation

The release latch is restored by motion from the keyboard clutch check pawl (Figure 13). This motion is transferred by the clutch release link, intermediate release bellcrank and link to restore the release latch in the latch plate window.



(Right Side View)

Figure 13 – Release Latch Restoring

FILTER BAIL

Three arms on the filter bail pivot shaft extend upward and support the rear section of the filter bail (Figure 14). The rear of the filter bail is spring loaded toward the rear of the machine. The front edge of the filter bail is spring loaded up by two small springs located outside the keyboard end frames.

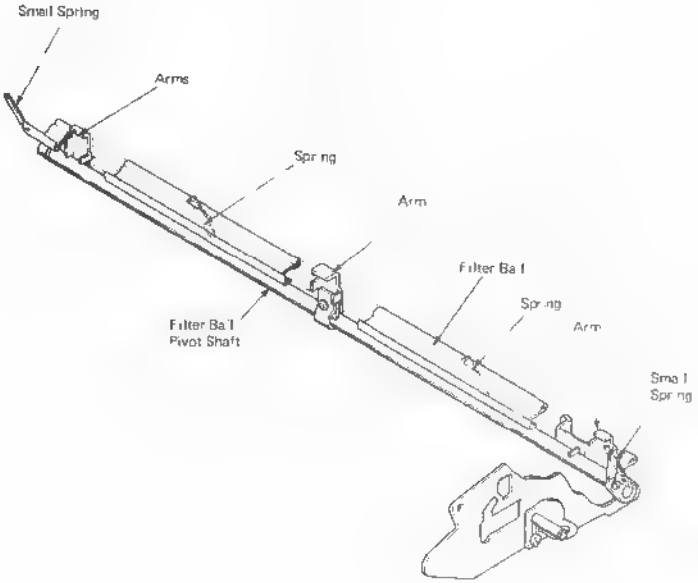


Figure 14 Filter Bail

The filter bail bellcrank transfers motion from the keyboard drive link to the filter bail pivot shaft. As the filter bail pivot shaft rotates toward the front of the machine, it drives the filter bail forward. The filter bail moving forward drives the latched interposer toward the front of the machine (Figure 15).

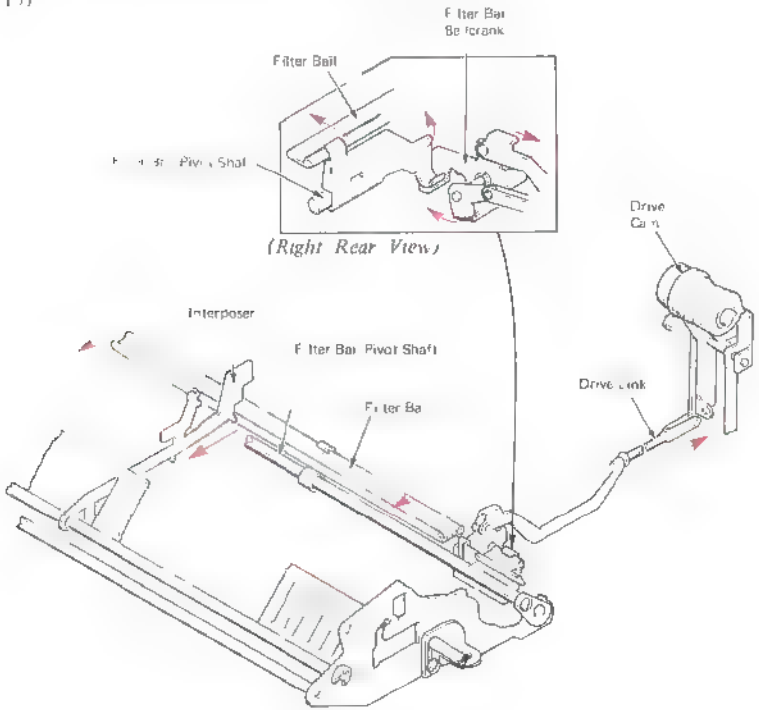


Figure 15 – Filter Bail Motion

A filter bail cam is located at the right end of the filter bail and is mounted on the keyboard side plate (Figure 16).

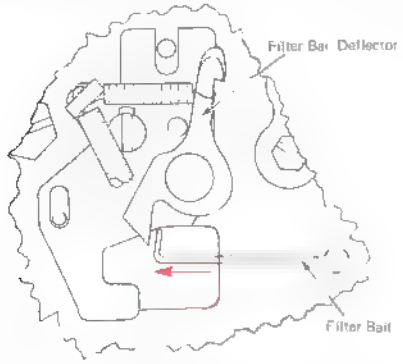


Figure 16 Filter Bail And Deflector At Rest

As the filter bail moves forward, the filter bail cam is pivoted toward the front (Figure 17).

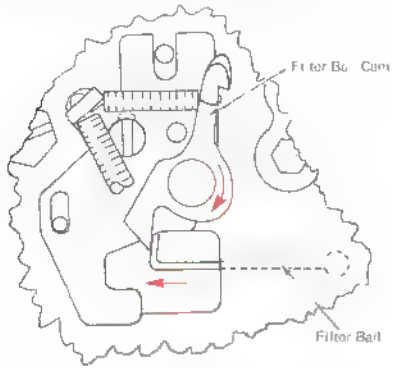
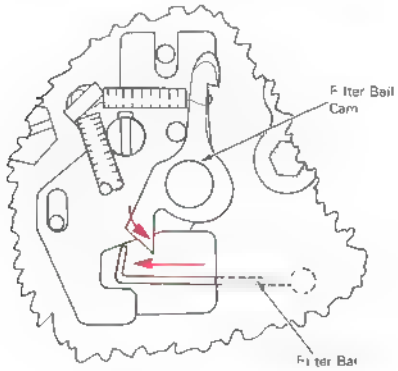


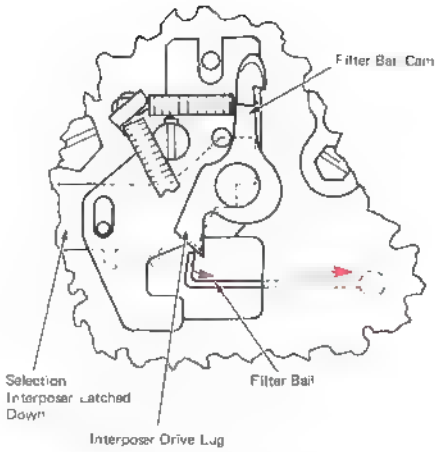
Figure 17 – Filter Bail Moving Forward

The filter bail cam restores to rest when the filter bail has moved past the tip of the cam (Figure 18).



(Right Side View)

Figure 18 Filter Bail Forward



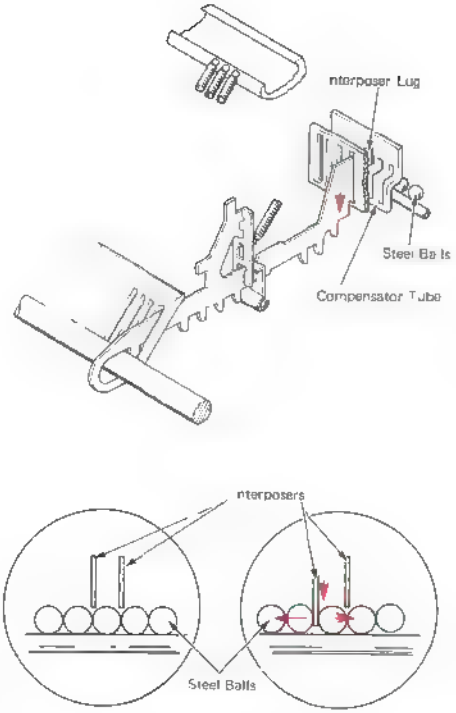
(Right Side View)

Figure 19 – Filter Bail Moving Back

As the filter bail restores to the rear, the filter bail cam deflects it down under the lug on any other interposer that is down in a latched position (Figure 19). This prevents the filter bail from bouncing a latched interposer as would happen if the filter bail dragged over the drive lug of an interposer and restored quickly upward behind the drive lug.

COMPENSATOR TUBE

A compensator tube prevents more than one interposer latching at one time. Each interposer has a lug in the compensator tube (Figure 20). The compensator tube contains closely spaced steel balls. When an interposer is moved down, the balls move in the compensator tube to block the downward movement of any other interposer. There is only enough space between the balls for one interposer. When the interposer is driven forward, the tube is cleared to accept another interposer.



(Front View)

Figure 20 – Compensator Tube

SELECTION BAILS

The selection bails pivot between the keyboard bottom plate sides (Figure 21). As a selection interposer is driven forward by the filter bail, motion is transferred to the selection bails. The lugs on the selection interposer determine which selection bails will be pivoted by that interposer. Each of the selection bails has a lug which extends into a slider on the reed switch assembly. As the selection bails are driven forward, motion is transferred to operate the reed switches.

BAIL REED SWITCHES

Each of the reed switch assemblies is mounted separately on the right of the keyboard bottom plate (Figure 22A).

Each reed switch assembly has a slider to which is mounted a permanent bar magnet. As a selection bail is driven forward, the lug on the bail moves the slider and magnet toward the rear (Figure 22B). The magnet causes the reed switch to close. After the keyboard clutch is released, and the filter bail drives the interposer, selection bails and reed switch sliders, the logic board will sense the closed reed switch(es). The logic board will then energize the character selection solenoid(s) for the character or the magnet(s) for the function required.

NOTE. The character selection solenoids are discussed in the Character Selection section.

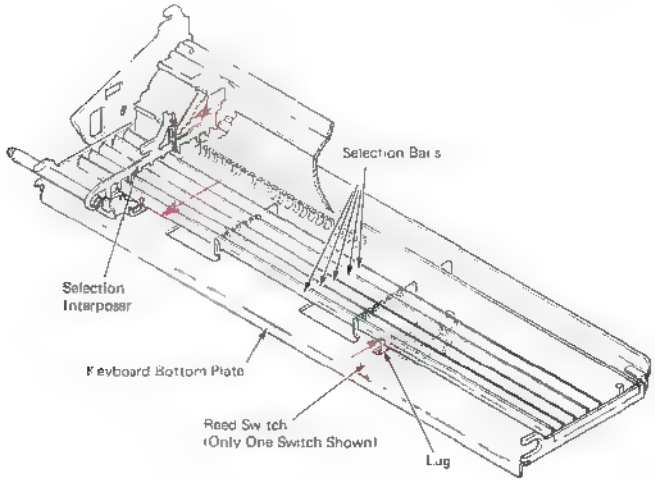


Figure 21 — Selection Bails

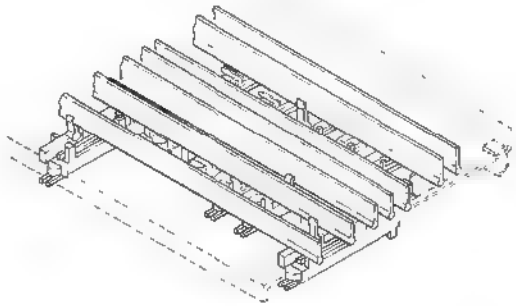
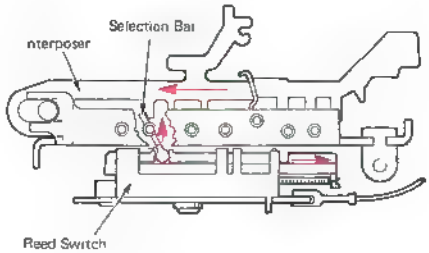


Figure 22A Bail Reed Switches



(Right Side View)

Figure 22B — Reed Switch Operation

CHARACTER CODE CHART

The character code chart may be used to determine which reed switches are operated for each character or function (Figure 23).

CODE CHART																			
CHARACTER		BAILS AND REED SWITCHES						CHARACTER		BAILS AND REED SWITCHES							
A	a	1	2			5	6	#	3				3				6
B	b	1	2		4	5	6	$	4	1	2						6
C	c	1			4	5	6	%	5	1	2						
D	d	1	2			5		¢	6	1							6
E	e		2		4	5		&	7	1			3				
F	f	1	2		4		6	*	8	1			3				6
G	g		2	3	4		6	(	9		2		3				6
H	h		2	3		5	6	)	0		2						
I	i	1		3	4	5		¼	½				3		5		6
J	j	1	2		4								3	4			
K	k	1		3	4	5	6	°	±		2				5		6
L	l	1		3	4		6	+	=		2			4	5		6
M	m		2	3		5		[	]				3	4			6
N	n	1				5	6	`	~				3	4	5		
O	o	1				5		'	"		2		3	4	5		
P	p		2		4			3	2		2		3				
Q	q	1			4			¶	§				3	4	5		6
R	r		2			5		`	"		2			4			6
S	s	1	2		4	5				1			3	4			
T	t	1			4	5		?			2						6
U	u		2	3	4	5	6	CR							5		6
V	v			3		5		Shift LC						4			
W	w	1		3			6	Shift (UC 7)						4			6
X	x	1		3		5	6	Index									6
Y	y	1			4		6	Backspace						4	5		6
Z	z			3				Spacebar						4	5		
1	1		2	3	4			Tab							5		
@	2	1															

Figure 23 - Code Chart

REPEAT KEYLEVERS

The hyphen/underscore keylever, spacebar, backspace, carrier return, and index keylevers repeat (Figure 24).

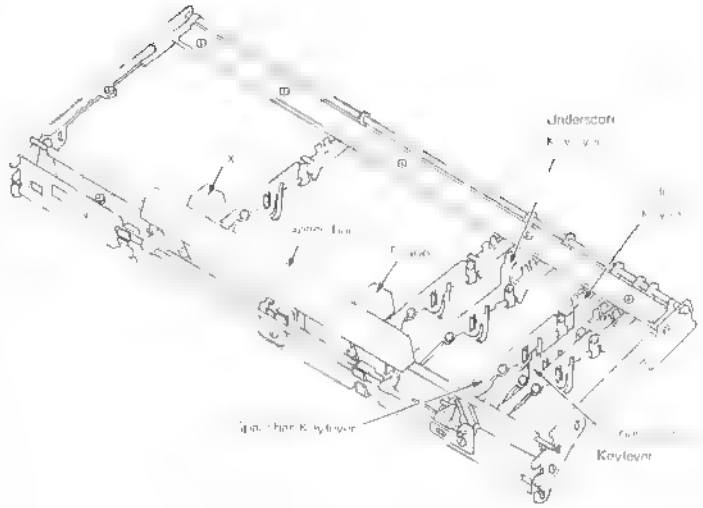
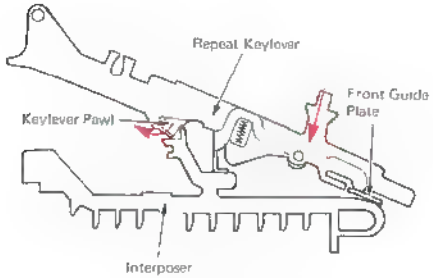


Figure 24 Repeat Keylevers

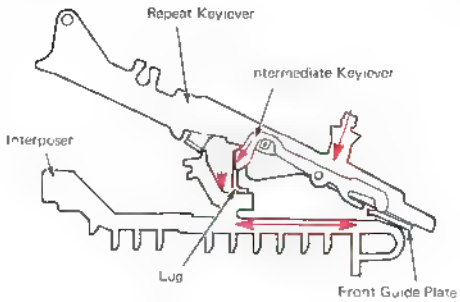
The repeat keylevers are two piece keylevers (Figure 25) As a repeat keybutton is depressed, the keylever pawl latches down the interposer for a single (non-repeat) operation After one selection operation, the interposer holds the keylever pawl toward the rear



(Left Side View)

Figure 25 Repeat Keylever Operation

As the keybutton is depressed further, the intermediate keylever sill contact the front guide plate and pivot down at the rear (Figure 26). The intermediate keylever has a lug which is aligned with the selection interposer. While the keybutton is held depressed in the repeat position, the interposer is held down by the intermediate keylever. In this position the interposer latch is held down too low to contact the latch plate The keyboard clutch remains unlatched and rotates until the interposer is restored when the keybutton is released As the keyboard clutch rotates, the filter bail drives the selection interposer forward producing a character or functional code. Each time a character or function code is produced, the machine types the character or performs the function of the keybutton depressed



(Left Side View)

Figure 26 – Repeat Keylever Operation

CODE KEYBUTTON

Located on the left side of the keyboard is the code keybutton (Figure 27). The purpose of this keybutton is to change the particular character or function codes into machine operating codes. Fifteen keybuttons are marked with machine operations as well as characters. Holding the code keybutton depressed and depressing one of the marked keybuttons will produce a machine operating code For example Holding down the code keybutton and depressing the "I" keybutton will cause the machine to underscore the last word typed. The code switch is a slider type switch and supplies a ground signal to the logic board

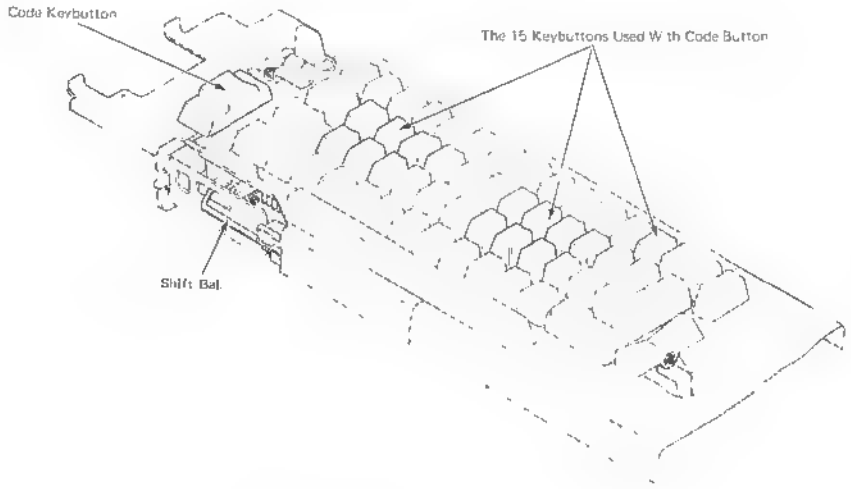


Figure 27 – Code Keybuttons

FUNCTIONAL KEYLEVERS

The basic operation of the functional keylevers is the same as the character keylevers. A code is provided by the selection reed switches when any of the functional keylevers are depressed. Only the differences between functional and character keylevers will be discussed

SHIFT KEYLEVERS

A shift keylever is located on each side of the keyboard (Figure 28). Either keylever can be used to produce a shift code The shift bail attaches the two keylevers together.

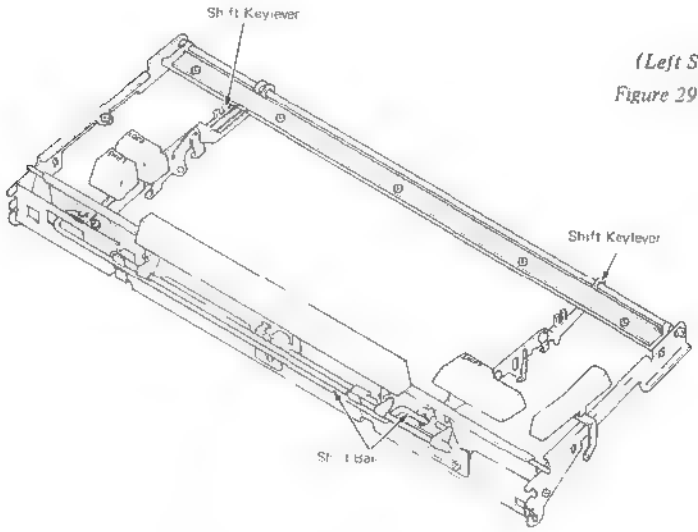
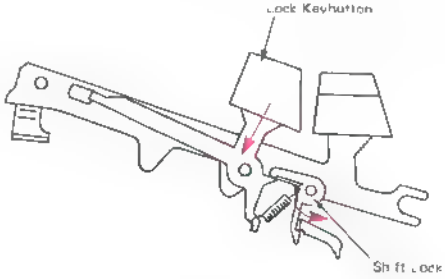


Figure 28 Shift Keylevers

The left shift keylever has a shift lock mechanism (Figure 29). This allows the operator to lock the keybutton down. The shift lock may be released by depressing and releasing either shift keybutton.



(Left Side View)

Figure 29 Shift Lock

The shift mechanism uses two selection interposers. One interposer produces an upper case shift code and the other interposer produces a lower case shift code Both interposers are located on the left side of the keyboard. When a shift button is depressed, the shift keylever and upper case interposer operate like the character keylevers and interposers.

When the shift keybutton is released, the lower case interposer is operated by the lower case intermediate keylever The lower case intermediate keylever pivots on a rivet mounted in a fixed keylever with no keybutton.

In the lower case position, the intermediate key lever is held down at the rear by upward spring tension at the front. In this position, the lower case intermediate keylever pawl is down and behind the interposer lug (Figure 30).

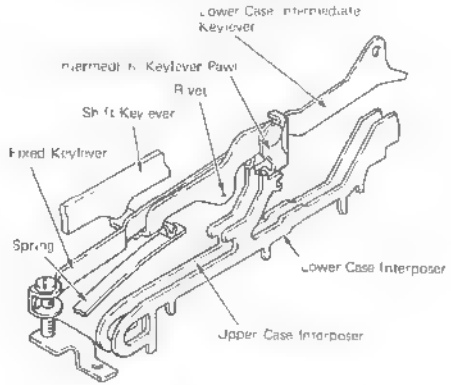


Figure 30 Shift Key Operation

When the shift keybutton is depressed, the shift keylever depresses the front end of the lower case intermediate keylever. The intermediate keylever pivots up at the rear and the intermediate keylever pawl restores above the lower case interposer (Figure 31).

As the shift keylever moves up, when released, the rear of the lower case intermediate keylever is allowed to move down under spring tension. This spring tension is greater than the spring tension of the interposer restoring spring. The lower case interposer is therefore operated and a lower case shift code is produced.

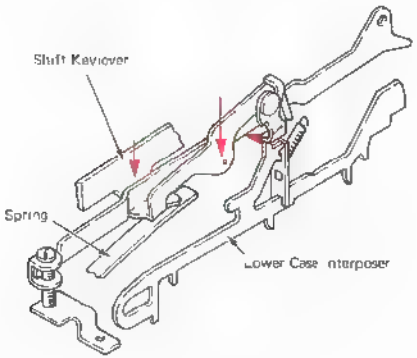


Figure 31 Shift Key Down

KEYBOARD MODE SWITCH

The keyboard mode switch is a reed switch mounted at the left of the other reed switches (Figure 32). The switch is operated by the keyboard mode selection bail.

As the upper case interposer is operated, it drives the keyboard mode selection bail forward. The keyboard mode selection bail is latched forward by the keyboard mode latch mounted on the keyboard bottom plate. The latch is located near the lower case interposer. In the latched position, the mode switch is closed. When the lower case interposer is operated, the keyboard mode release lug unlatches the keyboard mode selection bail and the switch is opened.

When a character is depressed on the keyboard, the logic board will check this switch to determine if an upper or lower case character code is required.

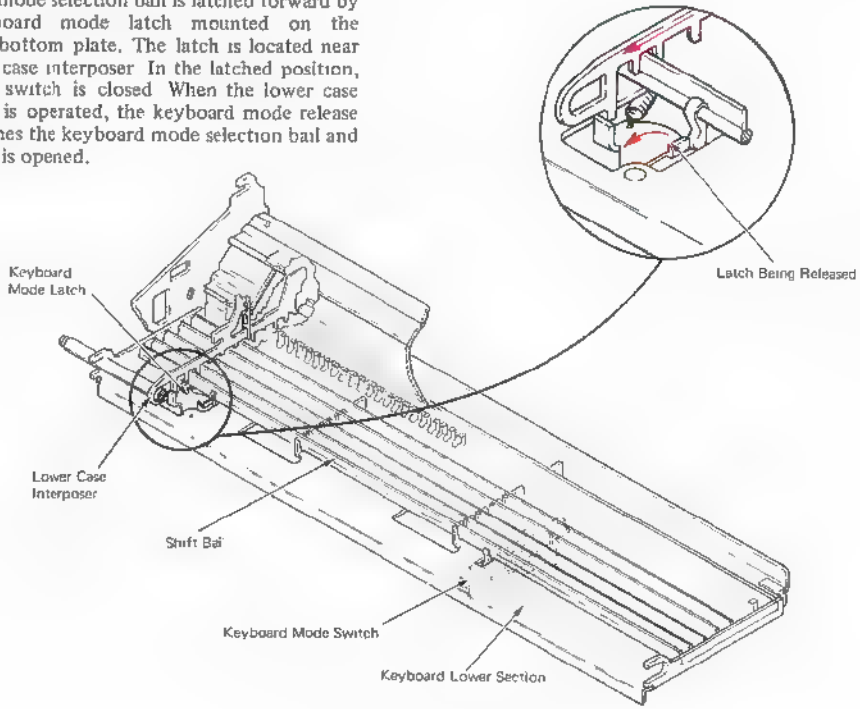


Figure 32 – Keyboard Mode Switch

SPACEBAR

The spacebar is mounted at the front of the keyboard on the spacebar pivot shaft (Figure 33) When the spacebar is depressed, the pivot shaft is rotated Rotational motion of the pivot shaft is then transferred through the keylever arm to depress the spacebar keylever. The spacebar interposer produces a code in the same way as a character interposer

MOTOR ON/OFF BUTTON

The motor ON OFF button and lever pivot on a stud at the right of the keyboard (Figure 34). A link connects the lever to the switch operating bail. The switch operating bail pivots on a bracket and shaft. Another link connects the operating bail and the motor switch

Mounted on the switch operating bail is a permanent magnet which controls the Power On Reset (POR) reed switch. The reed switch is mounted on the pivot bracket When the ON/OFF button is in the ON position, the reed switch is open. As the button is moved to the OFF position, the magnet closes the reed switch

When closed, the POR reed switch provides a ground circuit to the logic board The ground circuit to the logic board clears the line memory and sets the logic board to perform a POR when the motor ON/OFF button is returned to the ON position

KEYBOARD LOCK

The keyboard lock prevents the interposer latches from releasing the keybaord release latch

The keyboard lock is a bail which pivots between the keyboard side frames and is located behind the interposer latches.

The position of the bail is controlled by the On Off lever and a link As the On/Off lever is moved to the OFF position, the bail pivots against the rear of the interposer latches. If a keybutton is depressed, the bail prevents the interposer latch from pivoting to the rear, and so, it cannot latch the interposer down and cannot release the keyboard release latch

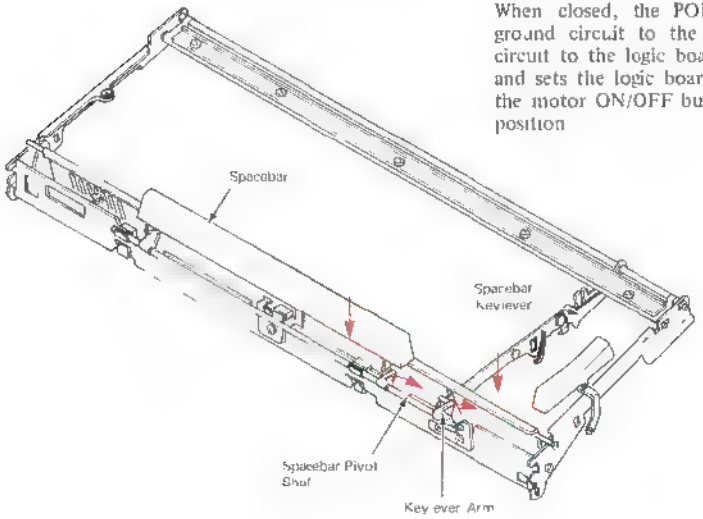


Figure 33 – Space Bar

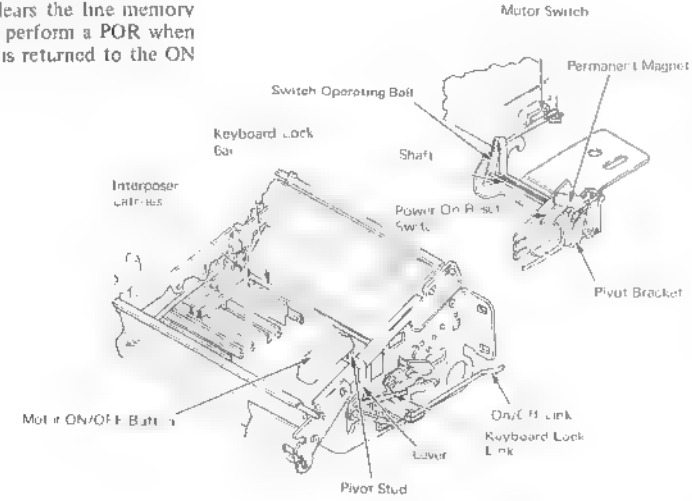
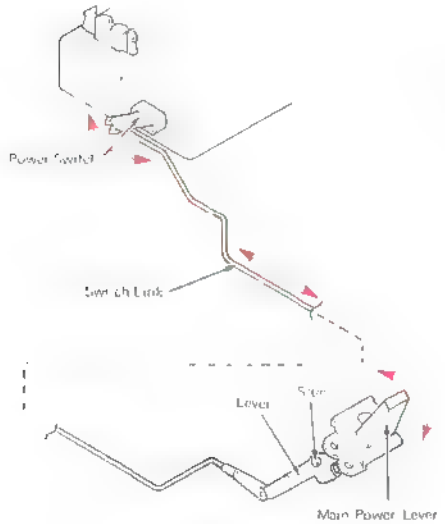


Figure 34 Motor ON/OFF Button

MAIN POWER LEVER

The main power lever pivots on a stud at the left of the keyboard (Figure 35). A switch link connects the lower end of the lever to the main power switch. With the power lever in the rear position the main power switch is closed.

NOTE The main power switch is discussed in the power supply section of this manual



(Left Front View)

Figure 35 Main Power Lever

MARGIN BELL AND MAGNET

The margin bell is mounted on a bracket and stud under the outrigger plate (Figure 36). Also mounted to the same bracket is a bell magnet. The armature of the magnet has a small weight located in a hole. The weight is called the clapper and is free to move in the armature

When the magnet is energized, the armature moves toward the bell. The armature stops against the residual and the clapper continues upward to strike the bell

NOTE: Optional keybuttons and switches are discussed in the optional features section

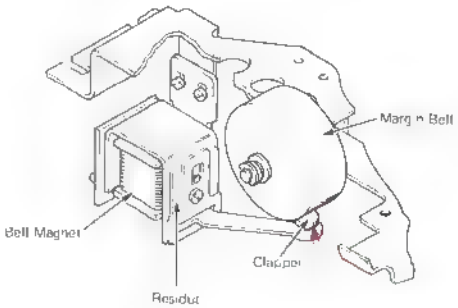
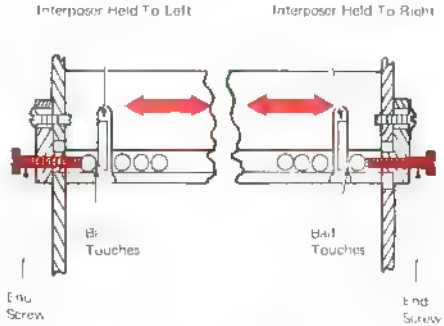


Figure 36 Margin Bell

KEYBOARD ADJUSTMENTS:

1 *Compensator Tube* Adjust the compensator end screws so that the first ball contacts a latched interposer at each end at the keyboard with the interposer manually held toward the end screws

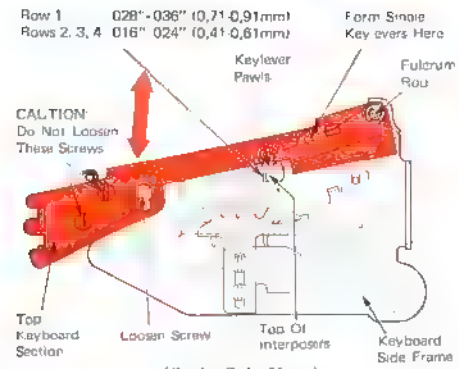


(Front View)

2 *Keylever Height* Adjust the top section of the keyboard up or down for a clearance of .028" - .036" (0,71 - 0,91mm) between the row one keylever pawls and the top of the interposers.

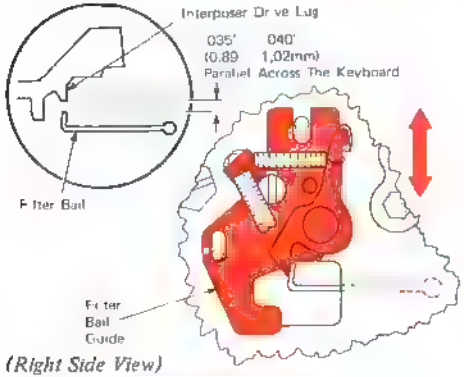
Each keylever may be formed for single keylever adjustment. Keylever pawl to interposer clearance in rows 2,3, and 4 should be .016" - .024" (0,41 - 0,61mm)

NOTE: The keylever height may be observed through the keyboard side frame. The keylever fulcrum rod must be fully engaged to the rear with the side frame locating lugs



(Right Side View)

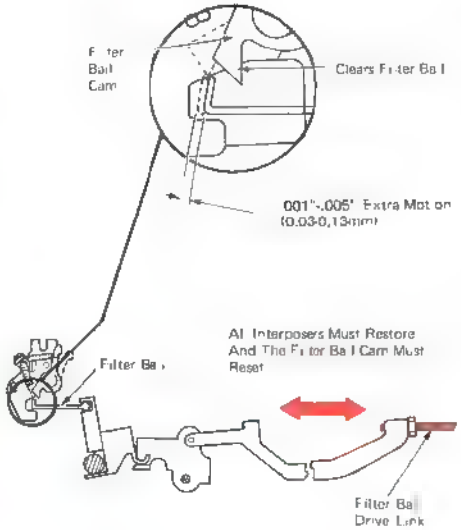
3. *Filter Bail Height* – Adjust the filter bail guides and the filter bail center support up or down for a parallel clearance of .035"-.040" (0,89-1,02mm) between the filter bail and the interposer drive lugs. The interposers must be at rest and the filter bail must be cycled under the drive lugs to check this adjustment.



(Right Side View)

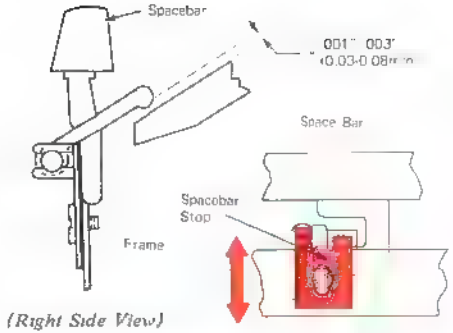
4. *Filter Bail Drive* – Adjust the filter bail drive link for .001" - .005" (0,03 – 0,13mm) drive of the filter bail after both the selection interposer is restored and the filter bail cam has reset behind the filter bail.

This extra motion may be observed at the end of the filter bail as the keyboard clutch is slowly hand cycled.



(Right Side View)

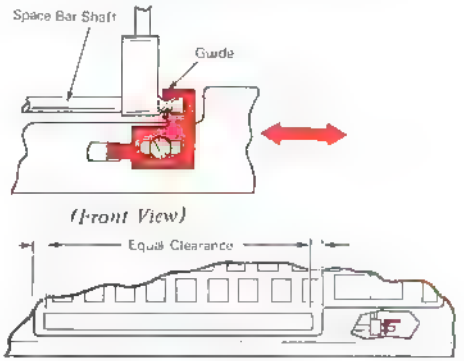
5. *Space Bar Height* – Adjust the space bar stop, up or down, so that the keylever arm clears the keylever by .001" - .003" (0,03 - 0,08mm) in the rest position.



(Right Side View) *(Front View)*

6. *Space Bar Left To Right* – Adjust the right space bar shaft guide left or right so that the space bar is centered in the covers.

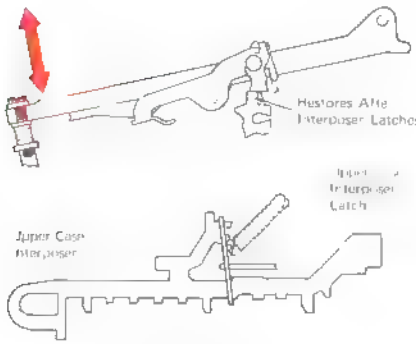
NOTE: Check that the shock mount adjustment (Adjustment 3b, Covers Section) is correct before making this adjustment.



(Front View) *(Top View)*

7 *Lower Case Keylever* Adjust the keylever adjusting screw up or down so that the lower case keylever pawl restores just after the upper case interposer latches down as the shift button is depressed

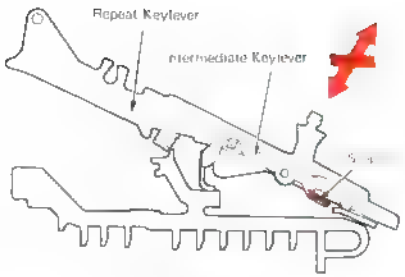
This relationship may be observed through the top of the keyboard



(Right Side View)

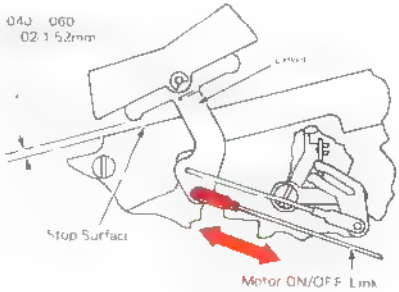
8 *Repeat Keylevers* Depress each repeat keylever to check repeat operation. If the keylever does not repeat, form the stop lug located on the intermediate keylever. Downward pressure on the front of the keylevers will form the lug down

CAUTION: This lug limits the downward motion of the intermediate keylever. If it is formed too far down, the interposer front and rear motion will be limited when the keylever is held down in the repeat position. To adjust this lug upward, the top section of the keyboard must be removed



(Left View)

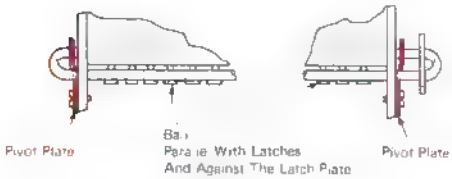
9 *Motor On/Off Lever* – Adjust the motor On Off link for a clearance of .040" - .060" (1,02 - ,52mm) between the lever and the stop surface with the motor switch in the OFF position



(Right View)

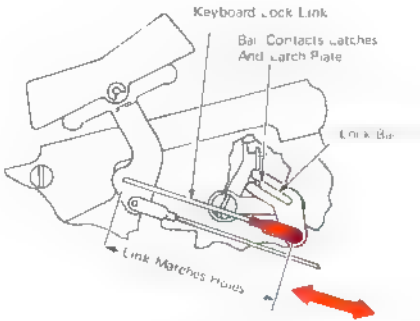
10 *Keyboard Lock (Parallel)* – Adjust the pivot plates front or rear so that the keyboard lock bail is parallel to and contacts the row of interposer latches and the latch plate. Remove the link to the On/Of lever before making this adjustment

NOTE: It may be necessary to remove the margin bell to observe this condition on the left.



(Top View)

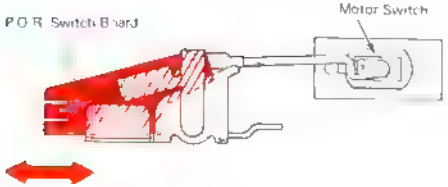
11. *Keyboard Lock* Adjust the length of the keyboard lock link to match the distance between the motor On/Off lever and the lock bail. This adjustment should be made with the On/Off lever in the OFF position and the bial in the forward rest position, against the interposer latches and the latch plate.



(Right Side View)

12 *POR Reed Switch* – Adjust the POR board front or rear so that the POR reed switch opens after the motor switch closes as the motor ON OFF lever is pushed to the ON position.

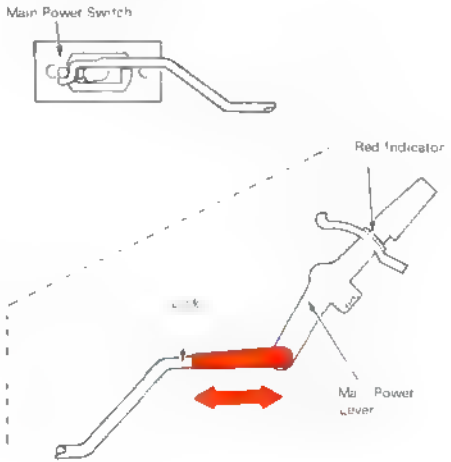
After making this adjustment, ensure that the reed switch remains closed when the ON/OFF lever is moved quickly to the OFF position. CAUTION The cycle clutch magnet may stay energized while the ON/OFF switch is OFF, if the P O R switch is intermittent. Readjust if necessary.



(Right Side View)

13 *Main Power Level* Adjust the link so that the lever fully covers the red indicator when the main power switch is in the OFF position.

NOTE: This adjustment may require revision to match the machine cover opening



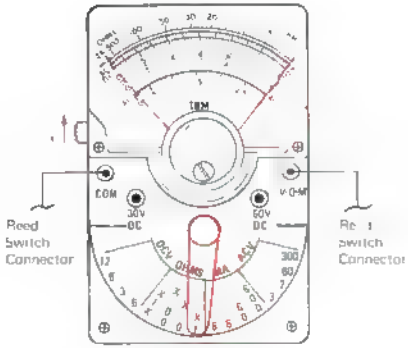
(Left Side View)

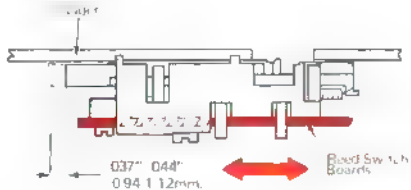
14 *Reed Switch Boards*

NOTE: This adjustment is preset and should not require change

Adjust the reed switch boards so that the switches transfer when the slider is moved .037" - 044" (0,94 - 1,12mm) from the rest position.

Ensure that the selection bails do not affect the rest position of the sliders. Or, remove the module from the bottom plate to make this adjustment

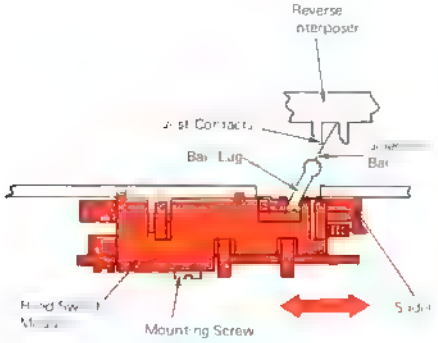




(Right Side View)

Reed Switch Modules — Adjust the reed switch modules so that the slider just contacts front of the lug on the selection bails.

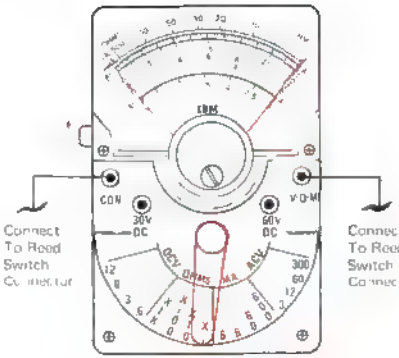
To make this adjustment, ensure that the reverse interposer is at rest and not held to the front by a selection bail. Loosen the mounting screw and slide the switch module to the front first, then move the module to the rear until the slider just contacts the lug on the selection bail and tighten the mounting screw. At this time the selection bail should just contact the reverse interposer.

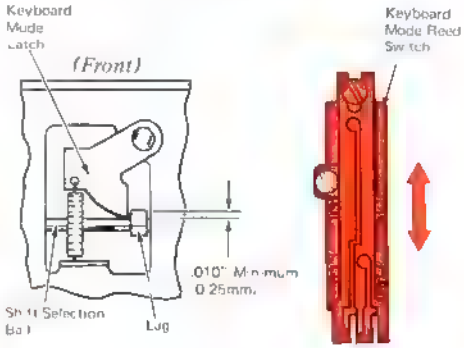


(Right Side View)

16 *Keyboard Mode Switch* — Adjust the keyboard mode reed switch front or rear so that the switch closes when the shift selection bail lug is a minimum of .010" (0,25mm) from the rear of the mode latch, as the shift selection bail is pivoted to the front.

The reed switch must reliably open as the bail pivots back to the rest position.



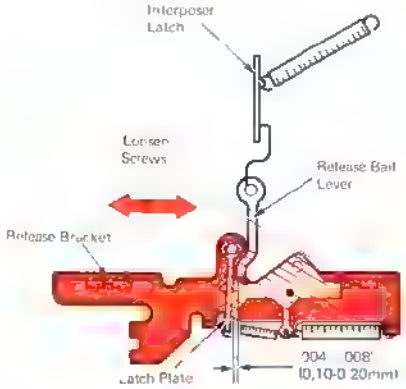


(Bottom View)

17 *Release Bracket* — Adjust the release bracket front or rear for a clearance of .004" - .008" (0,10 - 0,20mm) between the latch plate and the release bail lever.

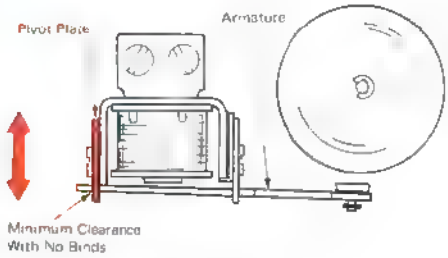
The release bail should be resting on the rear of the interposer latches while this adjustment is being made.

NOTE: After changing this adjustment, check Keyboard Clutch adjustment 4 Release Latch Restore, and 5 Latch Bale.



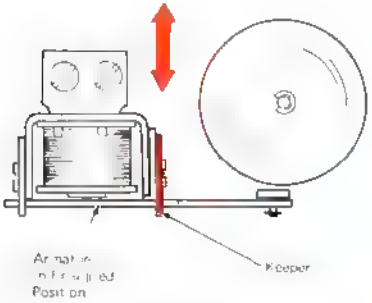
(Right Side View)

18 *Bell Armature Pivot* — Adjust the bell armature pivot plate up or down for minimum clearance without binds in the armature motion.



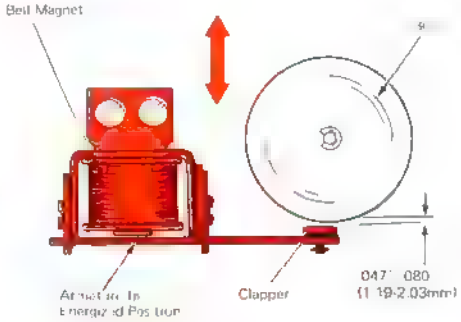
(Left Side View)

19. *Bell Magnet Air Gap* – Adjust the armature keeper down to just contact the armature with the armature in the energized position



(Left Side View)

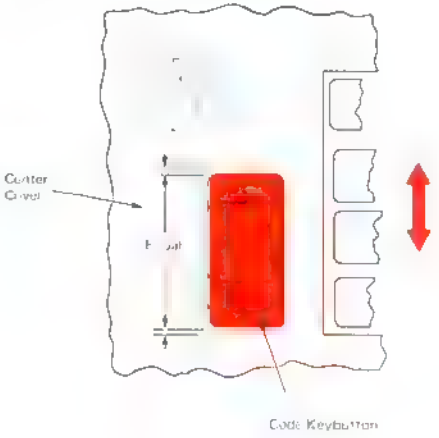
20. *Bell Magnet* – Adjust the bell magnet up or down for a clearance of .047"-.080" (1,19-2,03mm) between the clapper and the bell with the armature in the energized position.



(Left Side View)

21. *Code Switch* – Adjust the code switch front to rear for equal clearance between the keybutton and the center cover

NOTE: Check that the shock mount adjustment (Adjustment 3b, Covers section) is correct before making this adjustment



(Top View)

CHARACTER SELECTION OPERATIONAL THEORY

The character selection mechanism is located in the carrier (Figure 1). Several other mechanisms are also located in the carrier, such as, shift, fine alignment, print, selective ribbon and correcting tape. Each of these mechanisms is discussed in other sections. Only the character select or mechanism is discussed in this section.

There are ninety-six characters on the typehead. Forty-eight of these are uppercase characters and forty-eight are lowercase characters.

The characters are in four tilt rows. Each row contains six negative rotate positions, five positive rotate positions, and one zero (home) rotate position. The +6 rotate selection is used only for a shift operation.

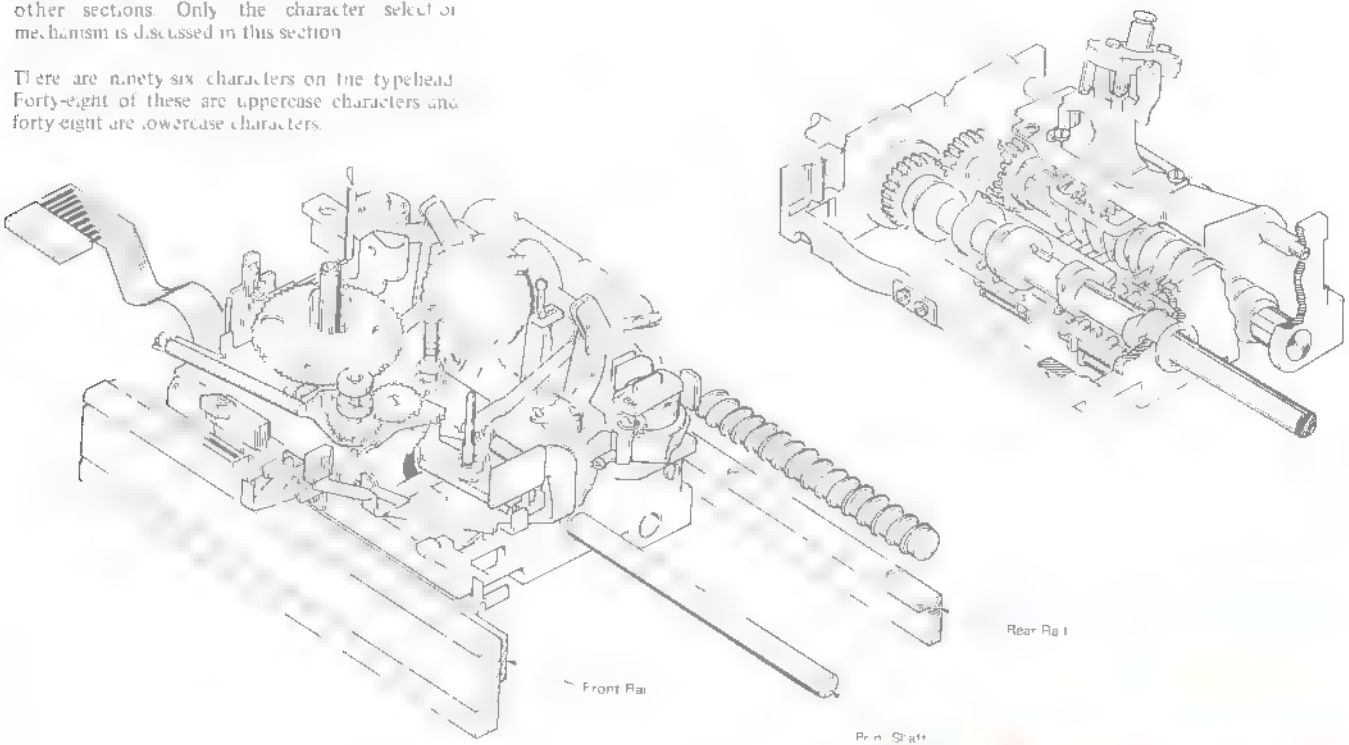


Figure 1 Carrier Character Selection

The character selection mechanism positions the typehead to print the character entered at the keyboard. The main components of this mechanism are the pin block assembly and selection cams (Figure 2)

PIN BLOCK ASSEMBLY

The pin block assembly changes electrical signals from the logic board into mechanical selection. Two tilt solenoids and three rotate solenoids are mounted to the pin block assembly. A cable from the logic board provides the electrical connection to operate these solenoids (Figure 3). Within the pin block assembly, there are six rotate selection pins and three tilt selection pins. Energizing a combination of solenoids selects the pins required for selection of a character. If no tilt or rotate motion is required, no solenoids are energized.

The pin block assembly is mounted by four screws to the lower side of the carrier.

The two tilt selection vanes are mounted between the left and center vane support shafts in the pin block (Figure 4). The three rotate selection vanes are mounted between the center and right vane support shafts. Each solenoid plunger engages a slot in an extension on a selection vane. A spring attached to each vane loads the vane to the left in the pin block. When a selection solenoid is energized, a selection vane is pulled to the right

When the solenoid is de-energized, the spring tension returns the vane to the rest position after the pin is restored.

Selection pins pass through windows in the selection vanes. Each pin is loaded to the rear by a compression spring in the pin block. The high surface of the selection cams holds the pins to the front in the reset position. There are keyways cut into each selection pin. Rotate pins have three keyways and tilt pins have two. These keyways engage one or more selection vanes. If no solenoids are energized, the vanes will hold all the pins out of the tracks in the selection cams as the high surface of the cams rotates away from the pins. A maximum of one tilt and one rotate pin is released at a time.

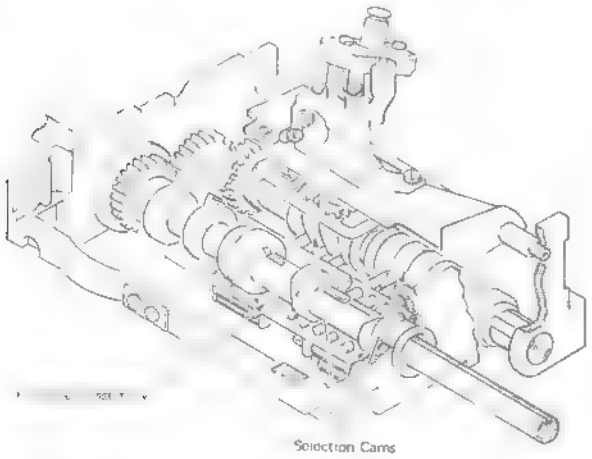
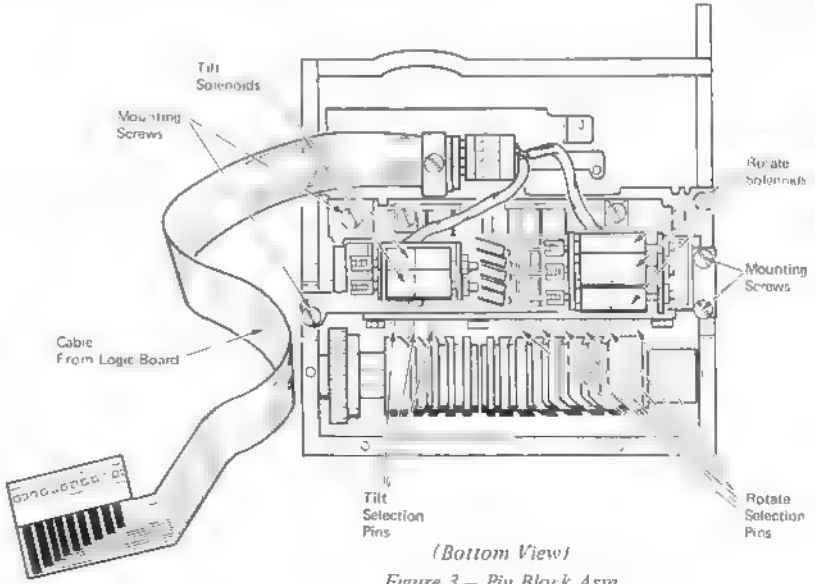
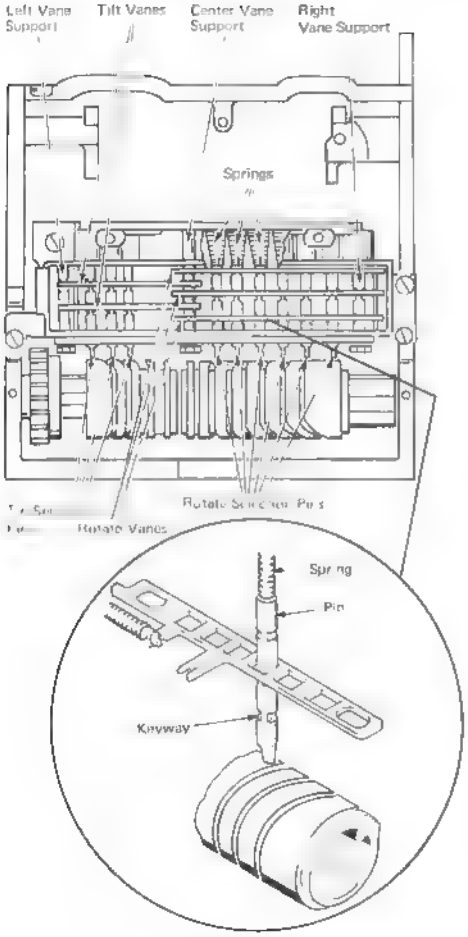


Figure 2 - Character Selection Mechanism



(Bottom View)

Figure 3 – Pin Block Asm.



(Bottom View)

Figure 4 Pin Block Assembly

The chart in Figure 5 shows the different combinations of solenoids energized to release the required tilt and rotate pins.

Tilt Solenoids Energized	Tilt Pins Released	Rotate Solenoids Energized	Rotate Pins Released
None	No Pins (Tilt 0)	None	No Pin (Home)
T1 And T2 Solenoid	Tilt 1 Pin	R1 Solenoid	R1 Pin
T2 Solenoid	Tilt 2 Pin	R1 & R2 Solenoid	R2 Pin
T1 Solenoid	Tilt 3 Pin	R1 & R3 Solenoid R2 & R3 Solenoid R3 Solenoid R2 Solenoid	R3 Pin R4 Pin R5 Pin R6 Pin

Figure 5 Selection Pin Chart

CAUTION. If the solenoids are energized or manually activated when the pin block is removed from the carrier, pins can be ejected at high velocity and cause injury.

SELECTION CAMS

The tilt and rotate selection cams provide the motion required to position the typehead during the print cycle (Figure 6).

The cams are allowed to slide left and right on splines on the selection sleeve. The sleeve is supported between the left and right sides of the carrier by the selection sleeve shaft. This shaft is located to the rear of the pin block assembly and is held in place by two setscrews. Rotational drive for the selection cams is provided by the selection sleeve. The selection sleeve is driven by the selection driven gear, which is part of the selection sleeve. This gear receives motion from the intermediate gear, which engages both the selection drive gear and the selection driven gear. The drive gear is mounted on the print sleeve and rotates every cycle.

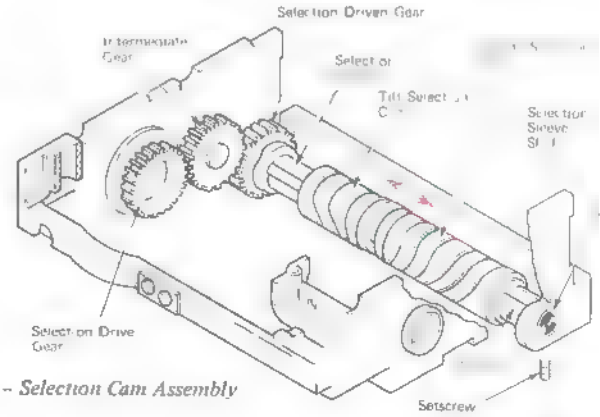


Figure 6 – Selection Cam Assembly

Four tracks are cut into the tilt selection cam (Figure 7). The track on the right end follows a direct path around the cam. This track is called the tilt cam follower track. The other three tracks are not parallel to the cam follower track and are used for character selection. From right to left the tracks are called T1, T2 and T3.

Seven tracks are cut into the rotate cam. The track on the left end follows a direct path around the cam and is called the rotate cam follower track. The other six tracks are used for character selection. From left to right, the tracks are called R1, R2, R3, R4, R5 and R6.

In the rest position, the selection tracks are in line with the selection pins in the pin block. When a pin is selected, it will follow its selection track. As the cam rotates, the pin causes the cam to move laterally on the selection sleeve. Each track provides a different amount of lateral motion for the selection cams. This lateral motion of the cams positions the typehead.

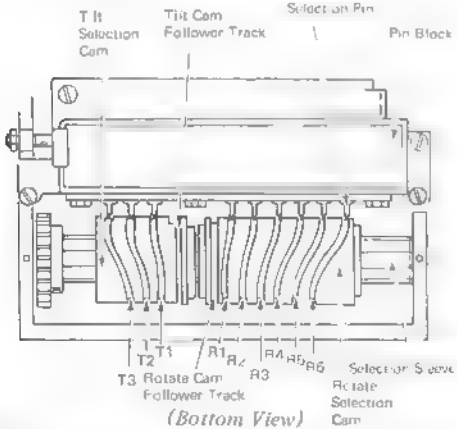


Figure 7 – Selection Cams

TILT OPERATION

The yoke and tilt ring assemblies are mounted on top of the rocker (Figure 8). The tilt selection cam provides the motion to move the tilt ring into the selected tilt position. An extension on the tilt cam follower bellcrank engages the cam follower track in the tilt selection cam. The bellcrank pivots on a pivot screw located in a lug at the rear of the rocker. As the selection cam moves left or right, it causes the bellcrank to pivot on the pivot screw. The tilt link assembly is fixed to the tilt cam follower bellcrank by the tilt adjusting screw and the tilt bellcrank pivot screw. The other end of the link is connected to a stud on the tilt ring assembly and is held in place by a "C"-clip. The tilt ring, tilt bellcrank and tilt selection cam are spring loaded into the rest position by the tilt spring. The tilt bellcrank stop controls the rest position.

TILT RING

The tilt ring pivots on two pins between the yoke arms. Movement of the tilt selection cam to the left causes the tilt ring to pivot on the pins, tilting the typehead. The tilt ring and typehead rest with the upper band of characters in the zero tilt position. All other tilt operations are upward from the rest position.

NOTE: The tilt ring is discussed in more detail in the Fine Alignment section of this manual.

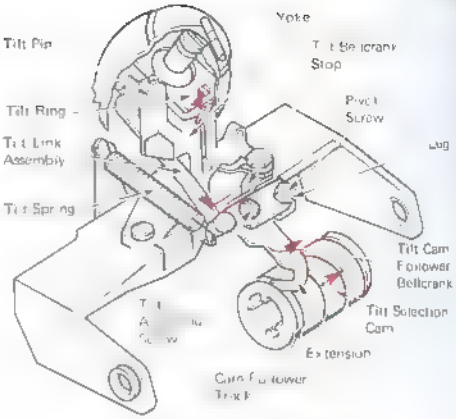
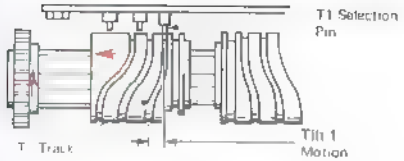


Figure 8 – Tilt Operation

TILT 1 OPERATION

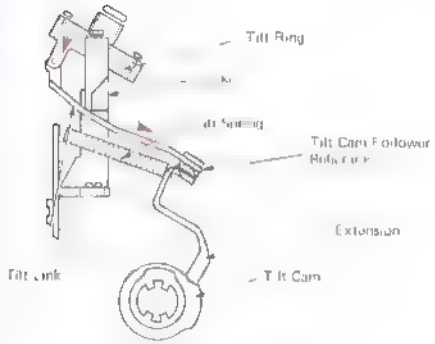
When the logic board energizes T1 and T2 solenoids together, the T1 selection pin is selected. The pin is engaged with the T1 track at the high restoring surface of the tilt selection cam. The cam is then rotated by the selection cam sleeve and the T1 pin is off the high surface and in the low surface of track T1. As the tilt selection cam is rotated through 180 degrees (Figure 9A), the deflection in track T1 forces the cam to slide to the left. This movement to the left rotates the tilt cam follower bellcrank as the cam follower extension follows in the cam follower track. As the tilt cam follower bellcrank pivots, it pulls the tilt link in the same direction. This action causes the tilt ring assembly to pivot into the tilt 1 position (Figure 9B).

The T1 selection pin remains engaged in the T1 track and moves the selection cam to the right as the cam rotates from 180 degrees to 360 degrees. This returns the tilt mechanism to the zero tilt position. The selection pin is restored in the pin



(Bottom View)

Figure 9A – Tilt 1 Operation

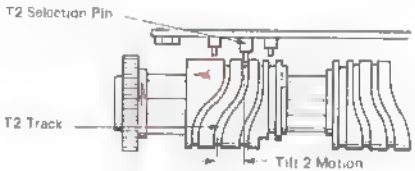


(Right Side View)

Figure 9B Tilt Mechanism

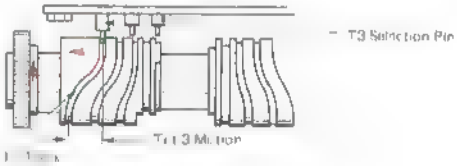
Tilt 2 and tilt 3 operations are the same except that a different combination of solenoids, selection pins, and tracks are used (Figures 10A and 10B)

If no tilt pins are selected during a character selection, the tilt cam will rotate 360 degrees, but will not move the tilt ring away from the home position. This results in a zero tilt selection.



(Bottom View)

Figure 10A T2 Operation



(Bottom View)

Figure 10B T3 Operation

ROTATE MECHANISM

The rotate mechanism (Figure 11) rotates the typehead into any of the typehead rotational positions. The rotate mechanism receives motion from the rotate selection cam to move the typehead.

Motion is transferred through the rotate rack plate, rotate pinion, lower ball socket assembly and the ball joint to rotate the upper ball socket. The typehead is keyed to the upper ball socket and will rotate any time the rotate pinion rotates.

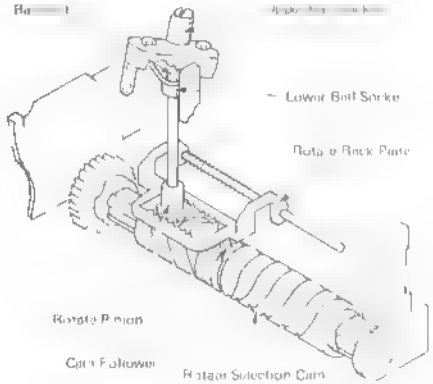


Figure 11 Rotate Mechanism

ROTATE RACK PLATE

The rotate rack plate transfers motion from the rotate selection cam to rotate the typehead. The rear of the rack plate is mounted on the rotate rack shaft and the front is supported by the rotate rack guide (Figure 12). This type of mounting allows the rack plate to move left and right. The rack plate is spring loaded against a stop screw located in the left side of the rocker. An extension on the rack plate engages the cam follower track in the rotate selection cam. When the cam moves laterally, the rotate rack plate will follow it.

The rotate rack shaft, which mounts the rear of the rack plate, is attached to the left and right pivot arms. The pivot arms are mounted on the rocker by pivot screws just to the rear of the rocker shaft. The pivot arms allow the rack shaft and rotate rack plate to be moved front to rear. A spring detent above each pivot arm holds the rack plate in either the front or rear position.

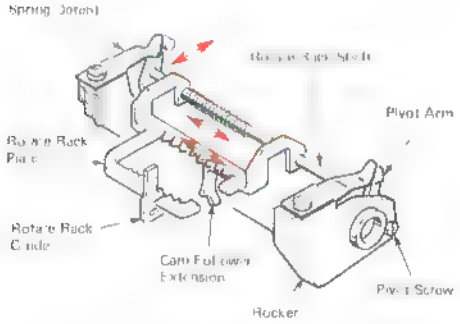


Figure 12 Rotate Rack Plate Assembly

The rotate rack plate has a negative rack (rear row of teeth) and a positive rack (front row of teeth). When the rack plate is in the rear position, the positive rack teeth engage the rotate pinion (Figure 13A). In the front position, the negative rack teeth are engaged (Figure 13B). The system used to transfer the rotate rack plate front-to-rear is discussed later in this section.

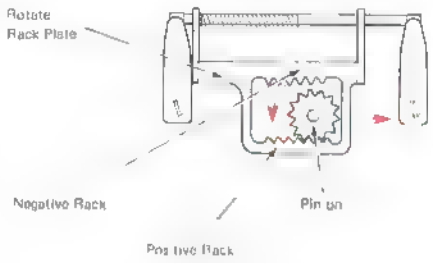


Figure 13A – Rack Plate In Rear Position

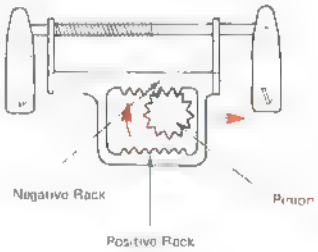


Figure 13B – Rack Plate In Front Position

POSITIVE ROTATION

When the logic board energizes the desired combination of rotate solenoids, a rotate pin will be selected. As an example, follow a +5 rotate operation. If the R3 solenoid is energized, the R5 selection pin will be selected (Figure 14). As the rotate selection cam rotates, the R5 pin is off the high restoring surface and is fully engaged in the R5 track. During the first 180 degrees of rotation, the cam will move to the right, under the control of the selection pin in track 5.

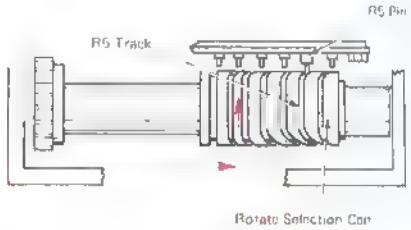


Figure 14 +5 Rotate Operation

Since the cam follower extension on the rotate rack plate is engaged in the rotate selection cam (Figure 15), the rack plate will follow the lateral movement of the cam. The rack plate is in the rear position during a positive rotate cycle and the positive rack engages the rotate pinion. As the rack plate moves to the right, the pinion will turn counterclockwise. The typehead rotates to the +5 position.

The rotate selection cam continues rotating from 180 degrees to 360 degrees and moves to the left, back to the home position. This is due to the R5 pin which is still engaged in the R5 track. The typehead rotates from +5 to the rest position.

As the rotate selection cam comes to rest (under power), the R5 pin will be restored in the pin block by the high restoring surface of the cam. The rotate selection vane will now enter the keyway of the pin.

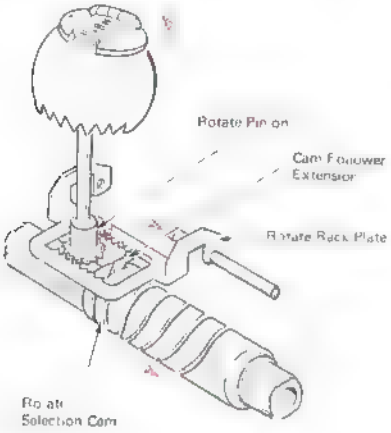


Figure 15 - Positive Rotation

ROTATE RACK TRANSFER OPERATION

The purpose of the rack transfer mechanism is to move the rotate rack plate into the front or rear position. The rotate rack solenoid assembly is mounted by two screws to the rack transfer bracket. The rack transfer bracket pivots on the bail shaft between the sides of the carrier (Figure 16). Two vertical yokes on top of the bracket engage the rotate rack shaft. When the bracket moves toward the front or rear, the rack plate also changes position. The rotate rack solenoid is energized for all negative selections and not energized for positive selections.

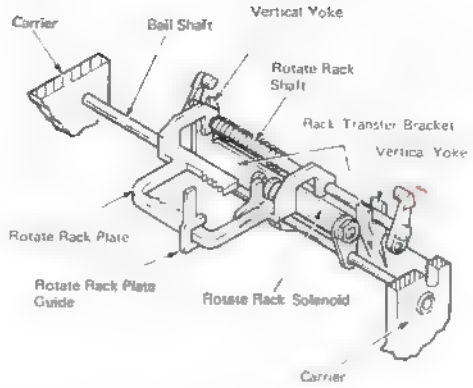


Figure 16 - Rotate Rack Transfer Mechanism

NEGATIVE RACK TRANSFER

The negative rack transfer cam follower is pivoted on the bail shaft (Figure 17A). During every selection cycle the follower receives motion from the negative rack transfer cam surface on the right end of the tilt selection cam. Each time the selection cam starts to rotate, the negative cam follower moves to the high cam surface before the cam moves to the left. If the rack plate is in the positive (rear) position and a negative character is selected, a negative rack transfer is necessary. Since the solenoid is energized, the slot in the plunger moves out of the path of the negative cam follower. The top end of the cam follower contacts the plunger and pushes the solenoid assembly and the rack transfer bracket toward the front (Figure 17B).

The bracket pivots, pushing the rotate rack shaft and rotate rack plate into the negative (front) position. The detent springs then hold the rack plate in this position. If the next character to be printed is also negative, the rack plate will not require a negative transfer and the motion of the negative cam follower will not affect the rack plate.

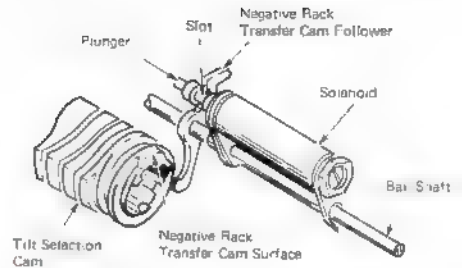
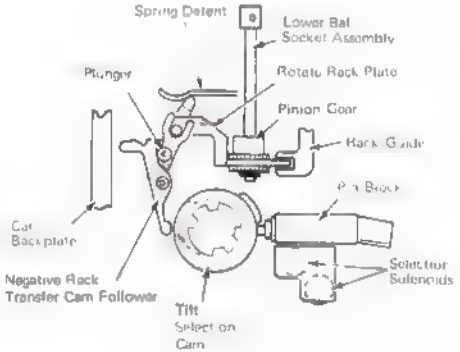


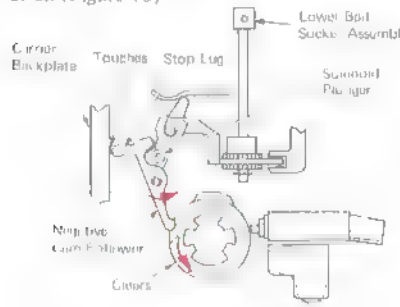
Figure 17A – Negative Rack Transfer Assembly



(Left Side View)

Figure 17B – Negative Rack Transfer Operation

A spring inside the solenoid returns the solenoid plunger to the rest position when the solenoid is de-energized. The negative cam follower is spring loaded against the backplate to provide a clearance from the solenoid plunger. A stop lug on the negative cam follower contacts the carrier backplate just before the follower reaches the low surface of the cam. The stop lug holds the negative cam follower clear of the low surface of the cam. This prevents the follower from interfering with the lateral movement of the cam during a selection operation (Figure 18).



(Left Side View)

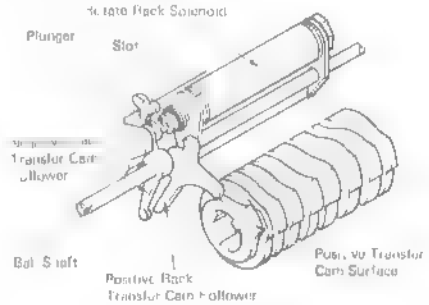
Figure 18 Negative Transfer Cam Follower

POSITIVE RACK TRANSFER

If the next character to be printed is positive, the rack plate must be transferred to the positive (rear) position to engage the positive rack with the pinion.

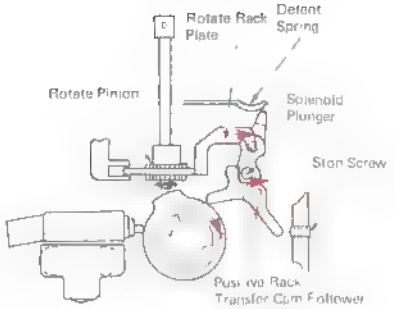
A positive transfer cam surface is on the left end of the rotate selection cam (Figure 19A). The positive rack transfer cam follower is pivoted on the bail shaft between the negative transfer cam follower and the solenoid. During every selection cycle the follower receives motion from the positive rack transfer cam surface. Each time the selection cam starts to rotate, the positive transfer cam follower moves to the high cam surface before the cam slides to the right. Since the solenoid is not energized, the slot in the plunger is out of the path of the positive transfer cam follower. The top end of the cam follower contacts the plunger and pushes the solenoid assembly and the rack transfer bracket toward the rear (Figure 19B).

The bracket pivots, pushing the rotate rack shaft and rotate rack plate into the positive (rear) position. The detent spring then holds the rack in this position. If the next character to be printed is also positive, the positive cam follower has no effect on the rack, as the rack will already be in the positive position.



(Front Left View)

Figure 19A Positive Rack Transfer



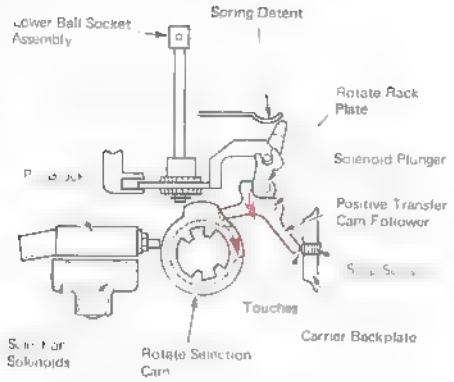
(Right Side View)

Figure 19B – Positive Rack Transfer Operation

After the positive rotate rack is engaged with the pinion, the positive transfer cam follower moves down the surface of the cam until the lower extension on the follower contacts a stop screw (Figure 20). This screw is located in the carrier backplate and holds the positive transfer cam follower clear of the low surface of the cam and plunger. The follower spring, mounted on the positive transfer cam follower, keeps both of the followers clear of the solenoid plunger. This allows free movement of the plunger.

Since both cam followers operate with every selection cycle, the effect of one must be prevented during each cycle.

During a positive rack transfer, the negative transfer cam follower enters the slot in the solenoid plunger. During a negative rack transfer, the positive cam follower enters the slot. The follower which has entered the slot has no action on the plunger and rack transfer bracket.



(Right Side View)

Figure 20 – Positive Transfer Cam Follower Operation

NEGATIVE ROTATION

The same rotate solenoids are energized to select a rotate band in the negative or positive direction. When a negative rotate character is selected, the logic board energizes the rotate solenoids and, at the same time, energizes the rotate rack solenoid. This causes the rotate rack plate to move forward, engaging the negative rack with the rotate pinion. For example, if a negative 6 character is selected, the logic board energizes the rotate rack solenoid as well as the R2 selection solenoid. The R6 pin engages the R6 track and the rotate selection cam starts to rotate. During the first part of the cam rotation, the rack plate is transferred forward to the negative position.

Because the R6 selection pin is engaged in the R6 track, the cam and the rack plate will move to the right. However, as the negative rack is now engaged with the rotate pinion, the typehead will rotate in a clockwise direction (Figure 21). After the character has printed, the typehead rotates counterclockwise as the rack plate moves left to the rest position. The negative rack is still engaged with the pinion. If the next character selected is positive, the rotate rack plate will transfer to the positive position at the start of that print cycle.

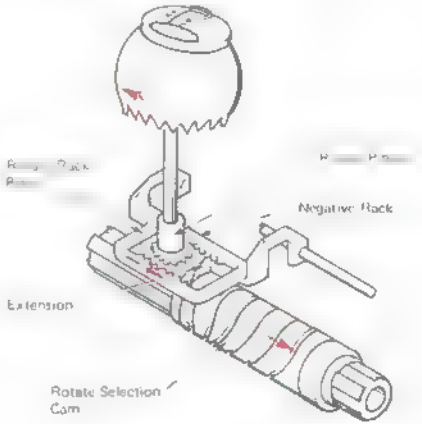
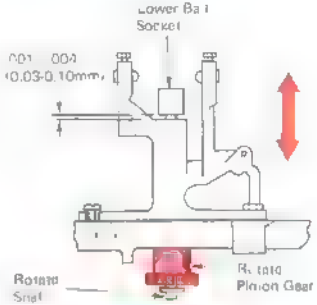


Figure 21 – Negative Rotation

CHARACTER SELECTION ADJUSTMENTS

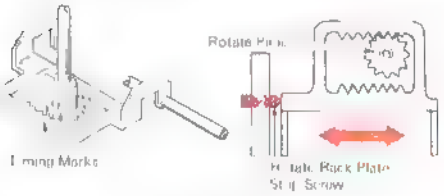
1. *Rotate Shaft End Play* – Adjust the rotate pinion gear up or down for .001"-.004" (0.03-0.10mm) end clearance of the lower ball socket.



(Rear View)

Rotate Rack Plate Home Position - Adjust the rotate rack plate stop screw until no movement of the rotate pinion gear occurs when the rotate rack plate is transferred front and rear manually. The rotate rack plate must be loaded against the stop screw when checking this adjustment, so half cycle a zero rotate character.

NOTE The timing marks should be aligned while checking this adjustment.

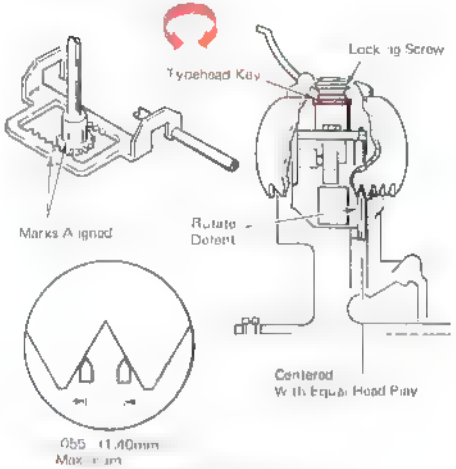


(Bottom View)

Typehead Homing Position the typehead so that the rotate detent is centered in the zero rotate typehead notch. To make this adjustment, loosen the locking screw.

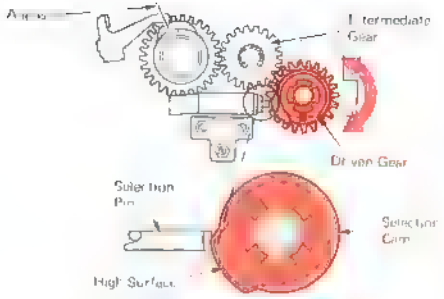
The timing marks on the rotate pinion and the rack plate must indicate correct tooth engagement. To check the adjustment, hand cycle an "r" (zero rotate character) until the print position is reached. Manually remove the rotate detent and rotate the typehead until the play is removed. Slowly release the rotate detent until it just touches the side of the typehead tooth. Repeat this check with the typehead rotated in the opposite direction. The detent should touch the other tooth the same distance away from the top of the notch.

NOTE Total head play should not be more than .055" (1,40mm).

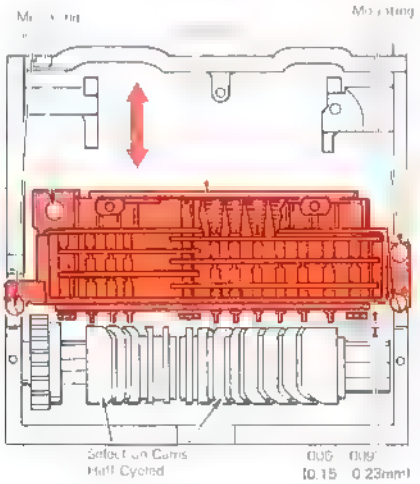


Selection Cam Timing (Preliminary) Align the selection pins with the beginning of the high surface on the selection cams. The correction restore cam follower must be aligned with the mark on the restore cam, while making this adjustment.

To make this adjustment, loosen the selection sleeve and reengage the intermediate and driven gears.



Pin Block Front And Rear Position the pin block front-to-rear for a clearance of .006"-.009" (0.15-0.23mm) between the selection pins and the selection cams with the machine half-cycled, (maintain parallel).



(Bottom View)

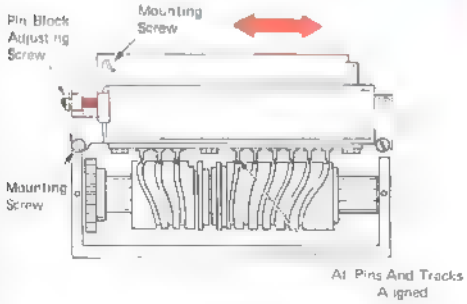
6 *Pin Block Left To-Right* – Adjust the pinblock left or right for the following conditions

The rotate detent should contact the typehead tooth 1/4 to 1/2 way down the slope furthest from the home position, in the positive 5 and negative 5 rotate positions (i.e., positive slope for positive selections and negative for negative selections). Typehead play must be removed in the same direction as the typehead rotation

The pin block mounting screws must be loosened when making this adjustment.

If the rotate detent contacts either or both of the typehead teeth more than half-way down the slope of the teeth, the machine will wear out typeheads

NOTE: Recheck adjustment 5 after this adjustment. Also, ensure that the tilt bellcrank stop (adjustment 14) and the tilt cam do not restrict the left and right adjustment of the pin block and rotate selection cam

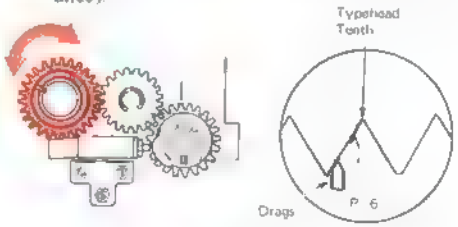


(Bottom View)

(Rear View)

7 *Selection Cams (Fine Timing)* – Adjust the selection cam timing so that the rotate detent drags lightly on the typehead tooth as the detent leaves the notch during the selection of a lowercase tilt 2, -6 rotate character.

NOTE. Skirt clearance must be correct before making this adjustment (adjustment 10, Fine Alignment section). When making this adjustment, check that adjustment 3 in Fine Alignment is correct (print sleeve end clearance).



(Rear View)

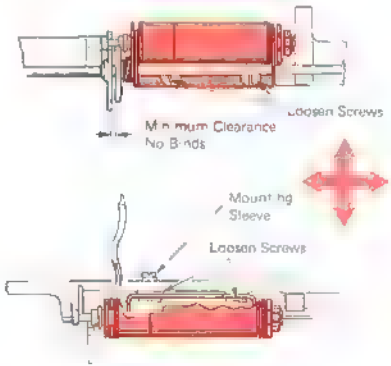
8 *Rotate Rack Solenoid*

NOTE: These adjustments are preset during manufacture and should not be changed

A. Position the rotate rack solenoid left or right so that the cam followers pivot freely with a maximum clearance of 003" (0.08mm) between them

B. Position the rotate rack solenoid front-to-rear and up or down so that the plunger slides freely. The front-to-rear adjustment is made by loosening the mounting screws and adjusting the mounting sleeve. The up and down and left to right adjustments are made with the mounting screws loosened.

NOTE: The rack transfer bracket must be removed from the carrier to make these adjustments. The short end of a bristo wrench may be used to align the cam followers and hold the follower spring in place during removal and reinstallation of the rack transfer bracket



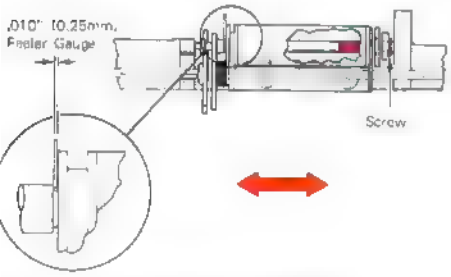
(Top View)

9. *Rotate Rack Solenoid Airgap*

NOTE This adjustment is preset during manufacture and should not be changed

Adjust the screw in the solenoid for a clearance of .002" .005" (0.05-0.13mm) between the screw and the plunger, with the plunger in the energized position

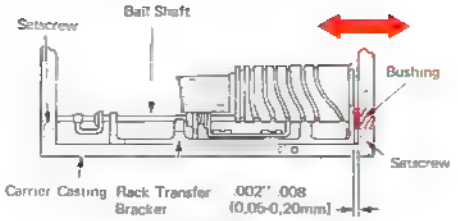
To make this adjustment, remove the "C"-clip and hold the plunger in the energized position. Adjust the screw in or out until a .010" (0.25mm) feeler gauge fits in the "C"-clip slot.



10. *Ball Shaft Bushing* Adjust the ball shaft bushing left or right for a clearance of .002"-.008" (0,05-0,20mm) between the end of the rack transfer bracket and the inside surface of the carrier.

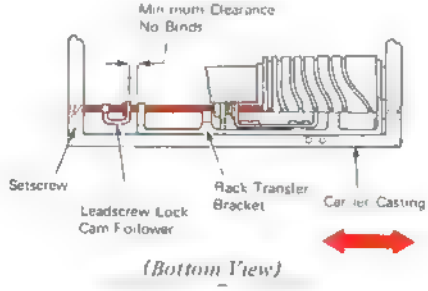
The rack transfer bracket should be held to the right when checking this adjustment

Loosen the setscrews in the rear of the carrier casting to make this adjustment It is necessary to remove the carrier to access these screws.



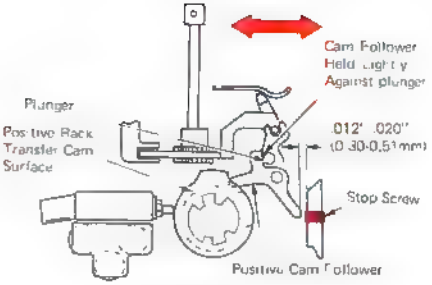
11. *Rack Transfer Bracket End Clearance* Adjust the bail shaft left or right so that the rack transfer bracket has minimum end clearance to the leadscrew lock cam follower with no binds

To make this adjustment, remove the carrier and loosen the setscrew in the left rear of the carrier casting.



(Bottom View)

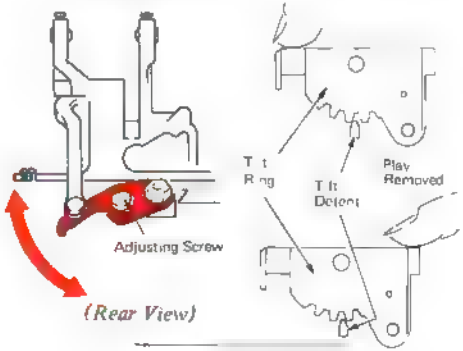
12. *Positive Cam Follower* Adjust the positive cam follower stop screw for a clearance of .012" .020" (0.30-0.51mm) from the cam follower with the cam follower held lightly against the solenoid plunger and the rack plate in the front position.



(Right Side View)

13. *Tilt Ring Position* – Adjust the tilt cam follower bellcrank so that, in the T2 position, the detent enters the center of the notch.

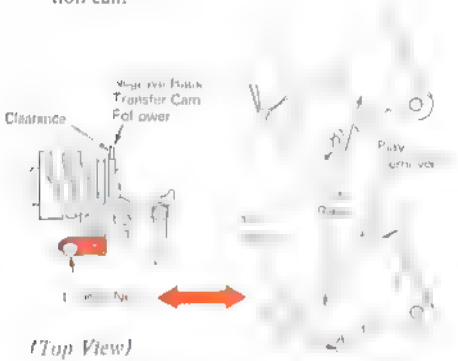
To check this adjustment, hand cycle a T2 character to the print position. Hold the tilt detent out of the notch while lightly pushing down on the front of the tilt ring. Then repeat while pushing down on the rear As the detent is allowed to enter the notch, there should be equal clearance in both front and rear positions



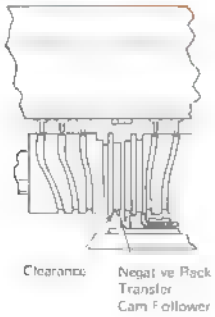
(Rear View)

14. *Tilt Bellcrank Stop* — Adjust the tilt bellcrank stop so that, in the zero tilt position, the detent enters the center of the tilt ring notch

NOTE: Check that the negative rack transfer cam follower clears the side of the cam and cannot rest on the outer surface of the selection cam



(Top View)



(Bottom View)

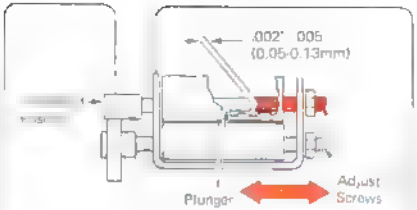
15. *Selection Solenoid Airgap* - Adjust the selection solenoid adjusting screws for a clearance of .002" 005" (0,05-0,13mm) between the adjustment screws and the selection solenoid plungers in the energized position.

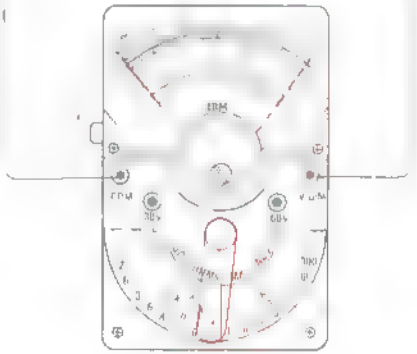
Hand cycle the machine until the selection pins are on the restoring surface of the selection cams. Energize the solenoid to be checked.

Clamp one VOM lead to the solenoid bracket and the other lead to the solenoid plunger Loosen the locknut and turn the adjusting screw until the meter indicates zero ohms. Turn the screw in the opposite direction until the meter indicates an open circuit, then 1/16 of a turn more. Tighten the locknut and hand cycle the carrier to the rest position.

NOTE: Damage may result if solenoids are energized continuously for 5 minutes or more

If more than one solenoid is energized at the same time, and one solenoid plunger contacts the adjusting screw, the continuity check of the other solenoids will be affected.





CHARACTERS USING ONE SOLENOID	
Character	Solenoid
2	R1
/	R2
z	R3
p	T1
r	T2

SHIFT OPERATIONAL THEORY

The purpose of the shift mechanism is to rotate the typehead 180 degrees between the lowercase and uppercase rest positions

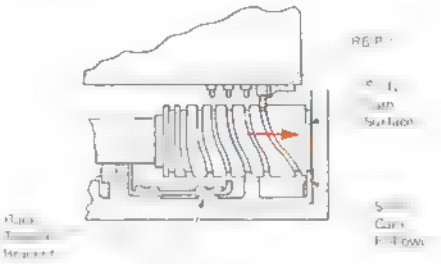
The typehead is always rotated counterclockwise during a shift operation The rotate rack must be in the rear position for the first half of a shift cycle A rack transfer operation may be necessary for this condition. The rack transfer operation is discussed in the Character Selection section.

When a shift operation is required, the logic board starts a no print cycle and energizes the R2 selection solenoid. This selects the R6 pin and the selection cams start to rotate. The rotate selection cam receives maximum motion under the control of the R6 pin (Figure 1A). At this time, the typehead has been rotated 90 degrees in a counterclockwise direction by the positive rack Located on the right end of the rotate selection cam is the shift cam surface. The shift cam follower is an extension at the right end of the rack transfer bracket (Figure 1B) When the rotate selection cam has moved to the right with the R6 pin engaged, the shift cam surface aligns with the shift cam follower

The shift cam surface pivots the shift cam follower to the rear. As the cam follower moves to the rear, the top of the rack transfer bracket moves toward the front. This transfers the rotate rack plate into the front position.

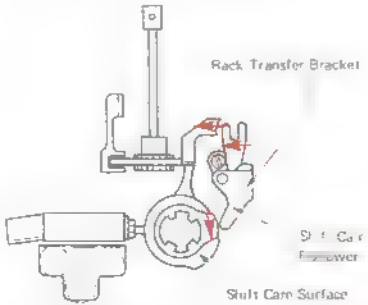
As the rotate cam moves to the left during the second 180 degrees of rotation, the negative rack rotates the typehead in a counterclockwise direction until it reaches the rest position.

At the completion of a shift operation, the rotate rack plate is in the front position The operation sequence is the same for an upper or lowercase shift. If the shift key is depressed, then allowed to restore, the typehead will rotate 360 degrees in the counterclockwise direction.



(Bottom View)

Figure 1A R6 Operation



(Right Side View)

Figure 1B Shift Operation

The shift mode switch is mounted under the rocker to provide a relationship between the keyboard and the typehead (Figure 2). It indicates the typehead position to the logic board. The normally closed switch is held open in the lowercase position by a cam surface on the rotate pinion. As the typehead and pinion move to the uppercase position, the switch is allowed to close

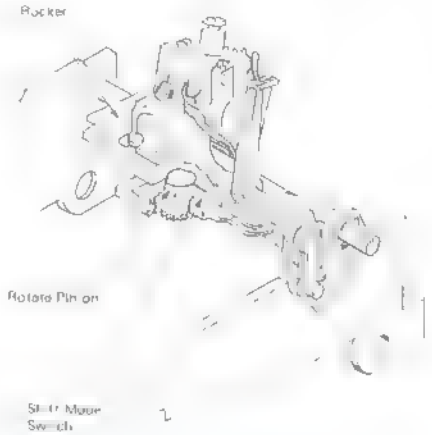


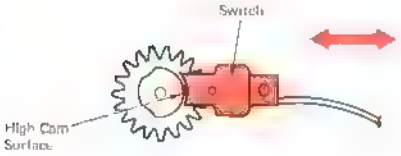
Figure 2 – Shift Mode Switch Operation

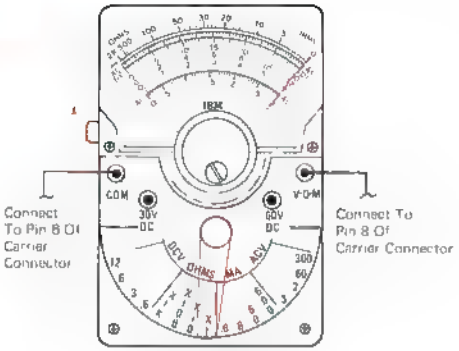
Shift Mode Switch – Adjust the shift mode switch left or right to close as the selection detents start to move up during a shift operation (lowercase to uppercase)

Check that the switch stays closed during a -6 rotate and +5 rotate selection in uppercase, and open for the same selections in lowercase

A VOM should be connected to pins 6 and 8 of the carrier cable connector at the logic board to indicate the open or closed condition of the switch

To adjust the switch, shift to lower case. Remove the selection cams. Loosen the switch mounting screw and move the switch to the right. Adjust the switch to the left until it just opens, then tighten the screw. Reinstall the selection cams and check the switch operation as described above.

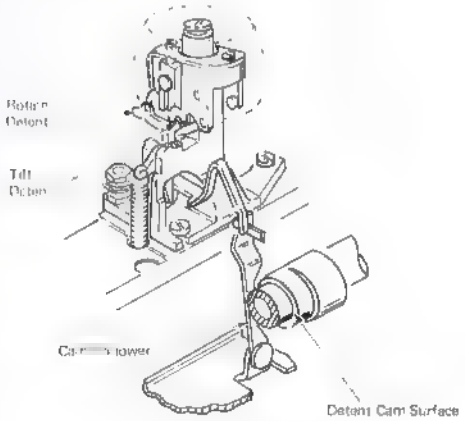




FINE ALIGNMENT OF TYPEHEAD

The functions discussed as fine alignment hold the typehead in the correct position to print the selected character clearly and ensure correct alignment with other characters on the same line. The selected character is moved to the approximate print position by the character selection mechanism.

The typehead is locked in position by the tilt and rotate detents before the character is printed (Figure 1). At this time, the carrier is locked to the leadscrew to prevent any carrier movement. After the print operation has taken place, the tilt and rotate detents and the lock on the leadscrew are disengaged. This allows the character selection mechanism to return the typehead to the rest position and the carrier to move.



(Left Front View)

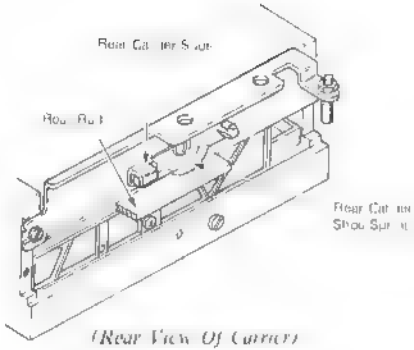
Figure 1 – Fine Alignment Theory

CARRIER SUPPORT

The carrier is supported by the print shaft and rear rail (Figure 2). The print shaft passes through the print sleeve, which is located in bearings in the carrier.

The rear carrier shoe guides the carrier on the rear rail.

Front-to-rear movement of the carrier is controlled by two adjustable buffers located behind the front rail. Vertical movement at the front of the carrier is limited by the front carrier shoe.



(Rear View Of Carrier)

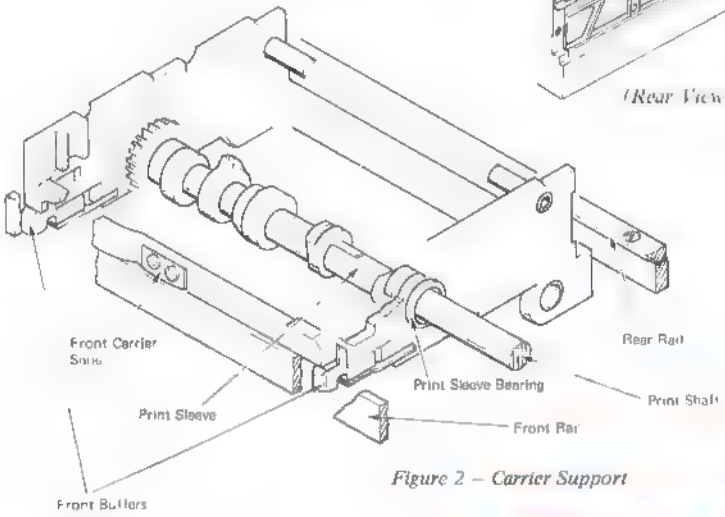


Figure 2 – Carrier Support

ROCKER

The rocker and the yoke support the tilt ring within the carrier (Figure 3). The rocker is pivoted on the rocker shaft between the carrier side frames.

The yoke is pressed into the top of the rocker. The yoke has two arms that extend up to provide pivot points for the tilt ring

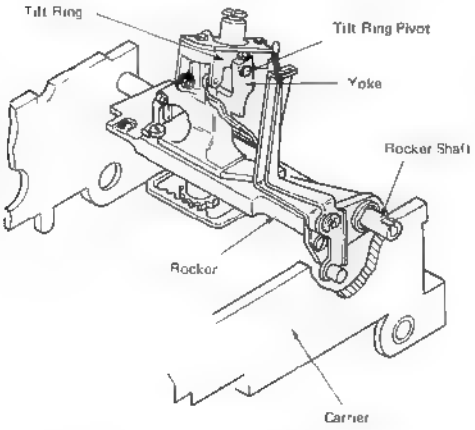


Figure 3 – Rocker

TYPEHEAD SUPPORT

Mounted on top of the tilt ring is the upper ball socket (Figure 4). Shims between the typehead spacer and the tilt ring provide a clearance in which the flange of the upper ball socket rotates. The typehead is attached to the upper ball socket by a spring clip within the typehead. The clip engages the sides of the typehead locking screw. A lever on the top of the typehead opens and closes the clip. Four lugs on the typehead key locate the typehead on the upper ball socket. The key is locked to the upper ball socket by the locking screw.

The tilt ring spring under the tilt ring spacer loads the upper ball socket and typehead toward the front of the machine. This keeps the tilt ring backup shoe in contact with the inside of the typehead

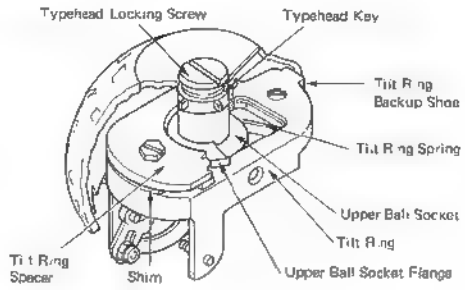
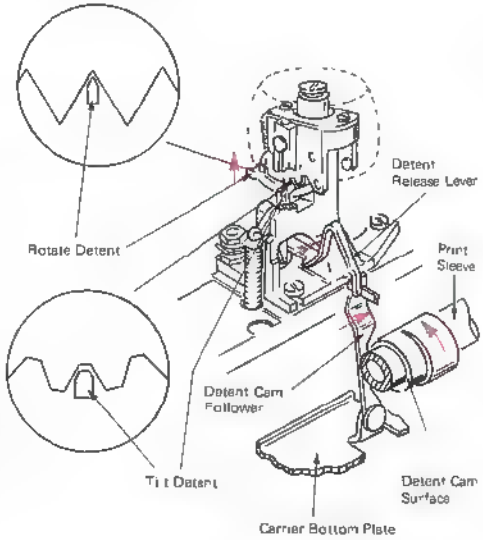


Figure 4 Typehead Support

DETENT OPERATION

When the typehead has been positioned by the selection mechanism, the tilt and rotate detents enter the teeth on the tilt ring and typehead. The tilt detent is engaged with the rotate detent and both are spring loaded toward the teeth (Figure 5). In the rest position the detents are disengaged from the teeth by a detent release lever, which pivots on a stud at the rear of the rocker. A detent cam follower pivots on a stud on the carrier bottom plate and engages the release lever.

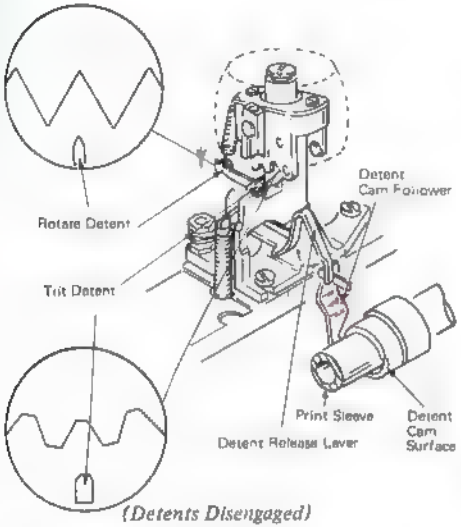
As the print sleeve and detent cam rotate, the cam follower moves to the low surface of the cam. This allows the cam follower and the release lever to move to the right under the spring tension applied to the tilt and rotate detents. The detents enter the teeth and hold the typehead firmly in place while a character is printed.



(Detents Engaged)
(Left Front View)

Figure 5 – Detent Operation

After the print cycle has passed the print point, the detents are disengaged from the teeth as the cam follower moves back to the high surface of the detent cam (Figure 6).



(Detents Disengaged)
(Left Front View)
Figure 6 – Detent Operation

LEADSCREW LOCK

To ensure that exact alignment is maintained, the carrier locks the leadscrew during every print shaft cycle. This occurs at approximately the same time as the tilt and rotate detents operate

The leadscrew lock assembly is located next to the leadscrew nut assembly on the leadscrew (Figure 7). There is a small space between the lock assembly and the leadscrew nut assembly. This space is just enough to allow the leadscrew to rotate freely

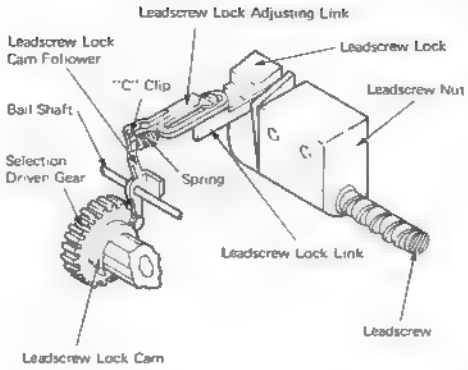
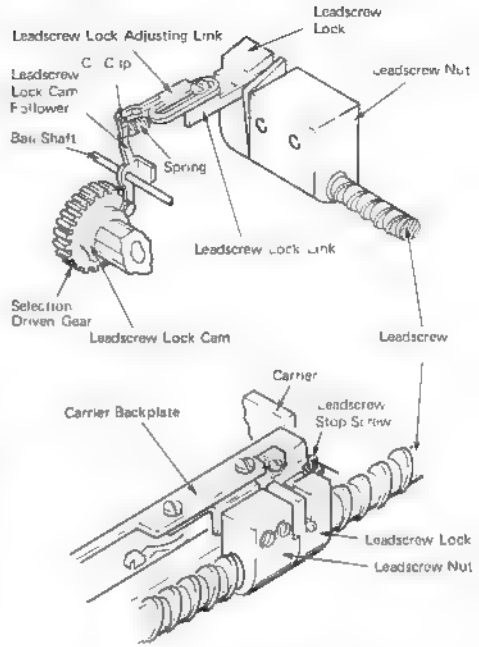


Figure 7 – Leadscrew Lock

The leadscrew lock cam is located on the selection cam sleeve next to the driven gear (Figure 8) This cam rotates every print shaft cycle. The lock cam follower is pivoted on the left end of the bail shaft The cam follower is loaded against the cam by a spring attached to the leadscrew home stop screw. The leadscrew lock adjusting link is attached to a stud on the cam follower by a small C-clip. An adjusting screw connects the adjusting link to the leadscrew lock link. One end of the lock link clips on a stud in the lock assembly.

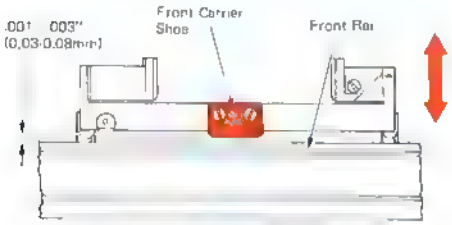
During a print shaft cycle, the cam follower moves to the low surface of the lock cam. The top end of the cam follower moves toward the rear and the spring rotates the lock on the leadscrew thread, forcing it against the leadscrew nut. The leadscrew nut, which is attached to the carrier backplate by two screws, is now locked to the leadscrew. As the lock cam rotates to the high surface, the lock rotates and releases the leadscrew nut.



(Rear Right View)
Figure 8 – Leadscrew Lock Operation

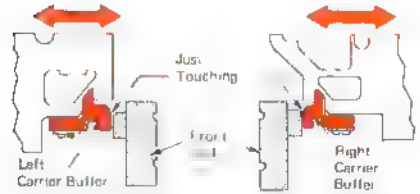
FINE ALIGNMENT ADJUSTMENTS

1 *Front Carrier Shoe* – Adjust the front carrier shoe up or down for a clearance of .001"-.003" (0,03-0,08mm) between the shoe and the front rail. The clearance must be maintained across the full writing line.



2 *Carrier Buffers* – Adjust the left and right carrier buffers front-to-rear until they just touch the rear of the front rail.

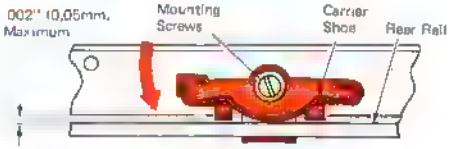
Ensure that the carrier moves across the full writing line without binds.



(Left Side View) *(Right Side View)*

3 *Rear Carrier Shoe* – Adjust the right side of the rear carrier shoe for a maximum clearance of .002" (0.05mm) between the shoe and the rear rail.

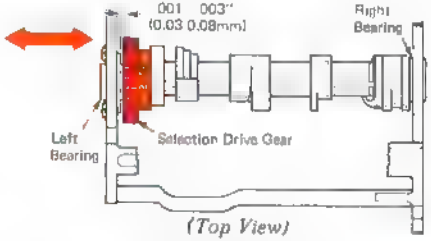
Loosen the screw to make this adjustment and rotate the shoe counterclockwise (viewed from the rear).



(Rear View)

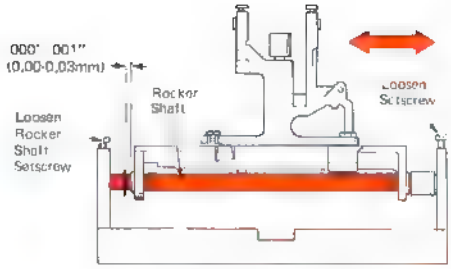
4 *Print Sleeve End Play* – Adjust the selection drive gear left or right for .001"-.003" (0,03-0,08mm) print sleeve end play.

NOTE: The tape lift cam may be used as a reference during this adjustment. Hold the print sleeve to the right against the right bearing. With the drive gear and the tape lift cam screws loosened, place a feeler gauge between the gear and cam. Hold the cam, feeler gauge and gear to the left against the left bearing. Tighten the cam screw. Remove the feeler gauge. Hold the gear to the right against the cam and tighten the gear screw.



(Top View)

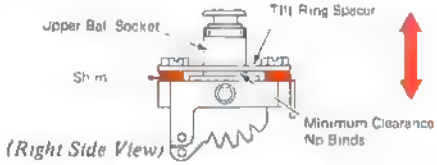
5 *Rocker End Play* – Adjust the rocker shaft left or right for .000"-.001" (0,00-0,03mm) side play in the rocker. The setscrews at the left and right end of the rocker shaft in the carrier casting must be loosened to make this adjustment.



(Rear View)

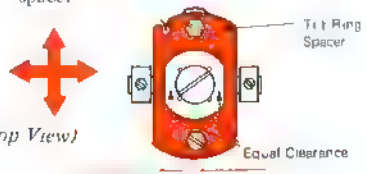
6. *Upper Ball Socket* – The upper ball socket must have minimum vertical play, but must still be free to rotate. Insert shims under the tilt ring spacer for this condition.

NOTE: If the tilt ring spacer screws are loosened, adjustment number 7 will need to be checked.



(Right Side View)

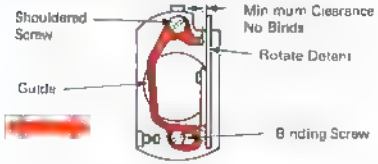
7. *Tilt Ring Spacer* – Position the tilt ring spacer front-to-rear and left-to-right to ensure equal clearance between the upper ball socket and the opening in the tilt ring spacer.



(Top View)

8. *Rotate Detent Side Play* – Adjust the rotate detent guide and the rotate detent nut to provide minimum clearance without binds

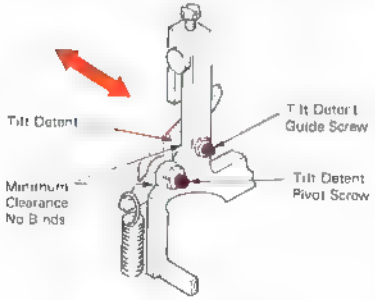
Thus adjustment can best be made with the tilt ring removed from the yoke.



(Bottom View)

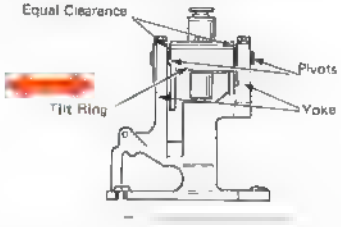
9. *Tilt Detent Side Play* – Adjust the tilt detent guide screw and the tilt detent pivot screw for minimum clearance wihout binds.

The guide screw should be adjusted to ensure that there is no side movement of the tilt detent. Adjust the pivot screw to provide a small amount of friction on the tilt detent



(Left Front View)

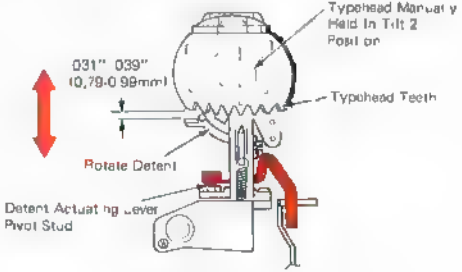
10. *Tilt Ring Pivot Pins* – Center the tilt ring in the yoke Ensure that there is no side play or binds in the tilt ring pivots. Move the tilt ring pivot pins left or right for this adjustment.



11 *Typehead Skirt Clearance* – Adjust the detent actuat.ng lever pivot stud up or down for .031"-.039" (0,79-0,99mm) clearance between the rotate detent and the tip of the teeth in the typehead

The print shaft keyway should be toward the bottom and the typehead manually held in the tilt 2 position to check this adjustment.

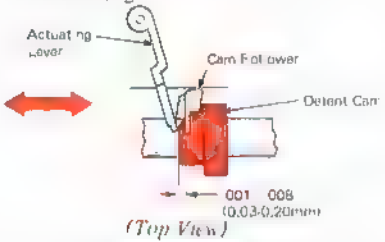
NOTE. Adjustments 11 and 12 may affect each other and should be checked if either is changed



(Left Side View)

12 *Detent Cam* - Move the detent cam left or right for a clearance of 001"-.008" (0 03-0,20mm) between the detent cam follower and the detent actuating lever The tilt and rotate detents must be engaged in the teeth. Check this adjustment in all tilt positions, and with the print cam follower on the high surface of the medium velocity cam

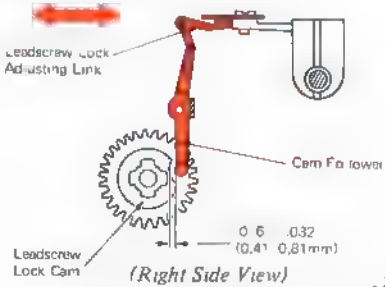
NOTE. Adjustments 11 and 12 may affect each other and should both be checked if either is changed



(Top View)

13 *Leadscrew Lock* – Adjust the leadscrew lock adjusting link for a clearance of 016"-.032" (0,41-0,81mm) between the cam follower and the low surface of the cam

Make this adjustment with the locknut in the locked posit.on



(Right Side View)

PRINT OPERATIONAL THEORY

The purpose of the print mechanism is to cause the typhead to strike the paper after the character to be printed has been selected. Motion for a print operation comes from the print shaft cycle clutch on the power module through the print shaft drive belt, print shaft pulley, print shaft and print sleeve (Figure 1). The print shaft cycle clutch is discussed in the print shaft cycle clutch section.

The print shaft belt tension is provided by an idler roller.

The drive to the print sleeve is transferred from the print shaft by the print key, which is engaged in a slot in the print shaft.

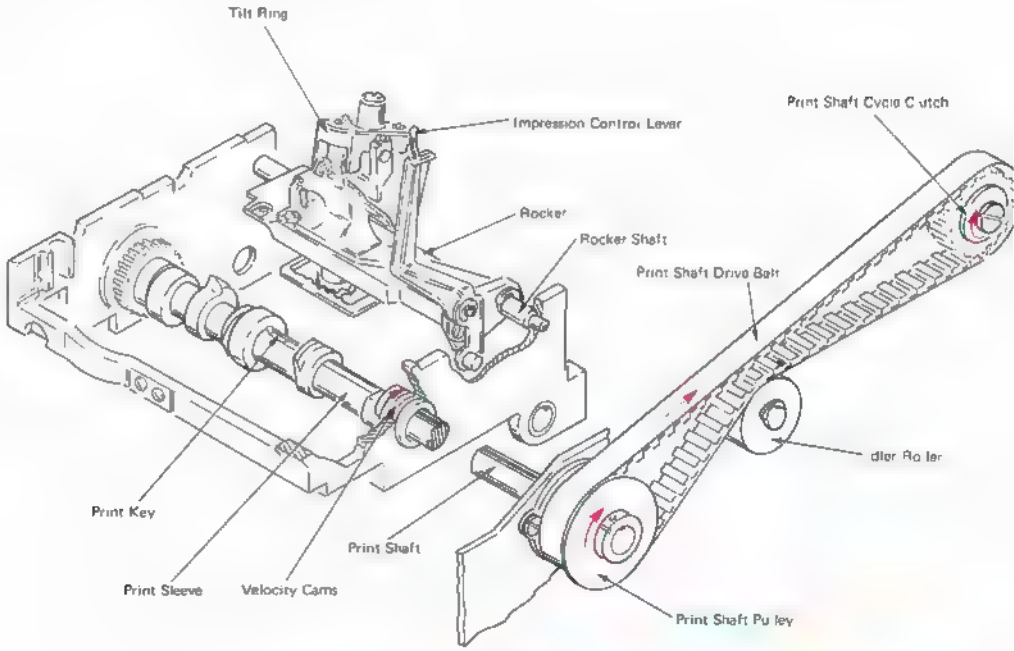


Figure 1 — Print Operation

PRINT VELOCITY

Velocity cams on the print sleeve rotate during each print cycle (Figure 2). The velocity cam follower roller, which follows one of the cam surfaces, causes the rocker to pivot on the rocker shaft and moves the typehead toward the platen. The selected character makes an impression on the paper.

The velocity at which the typehead strikes the paper is determined by the velocity cam selected with each character. There are three different velocities used to print bold, medium and light characters with equal impression. Each velocity cam has a different shape. Although each cam starts and finishes at a similar height, the high surface of the medium velocity cam is reached much quicker than on the low velocity cam. This has the effect of driving the rocker at a higher velocity than when driven by the low velocity cam. The high velocity cam relates to the medium velocity cam in the same way.

The velocity cam follower roller is moved to the high, medium or low surface on the cam to select the required velocity.

When a spacebar operation or other no-print function is selected, the velocity cam follower roller remains at the rest position to the left of the velocity cams. The rocker and typehead will not be pivoted toward the platen during a no-print function.

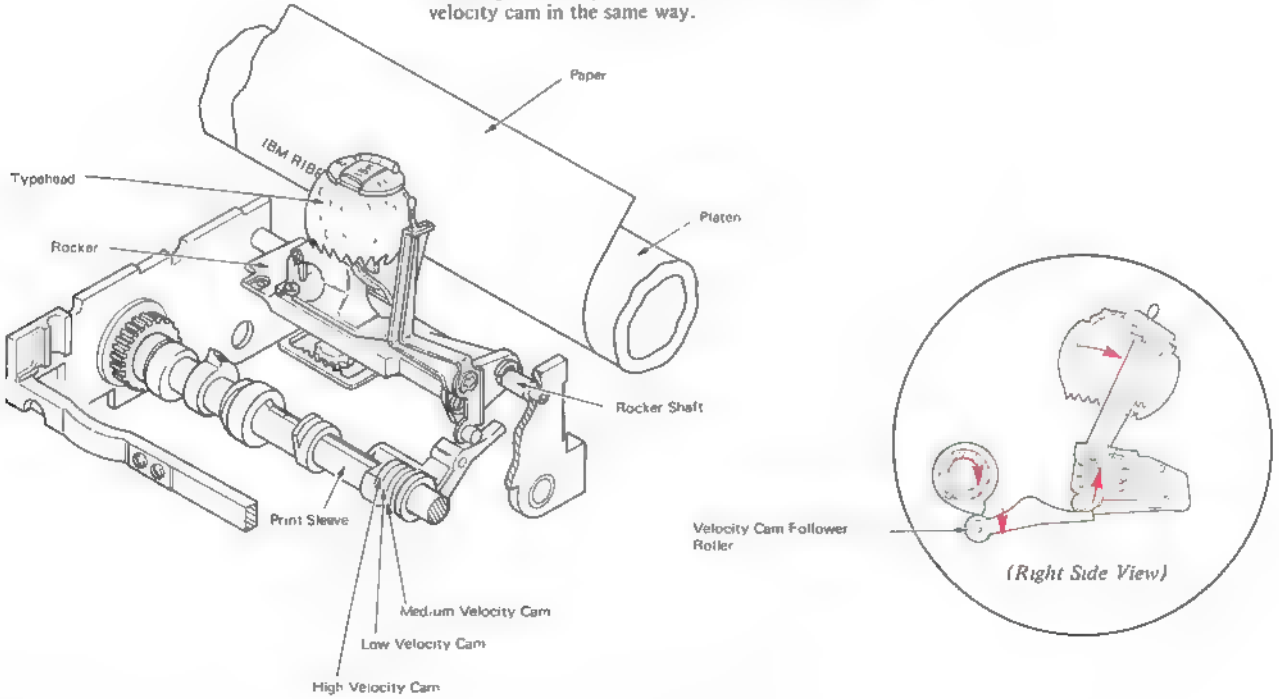


Figure 2 – Print Velocity

VELOCITY CONTROL

Four velocity selections are made by the logic board: high – medium – low and no-print. High velocity is selected to print most uppercase characters, and large lowercase characters. Medium velocity is used to print lowercase and small uppercase characters. Low velocity is used for punctuations and symbols. No-print is selected for functions not requiring the printing of a character.

Three magnets are located on the right of the carrier bottom plate. To make the four different velocity selections, the logic board energizes a combination of two velocity magnets (Figure 3). The operation of the center magnet, which is the correcting magnet, is discussed in the Correcting Mechanism section of this manual.

The upper magnet is energized for high velocity and the lower magnet is energized for low velocity. Both magnets are energized to select medium velocity. No magnets are energized for a no-print operation.

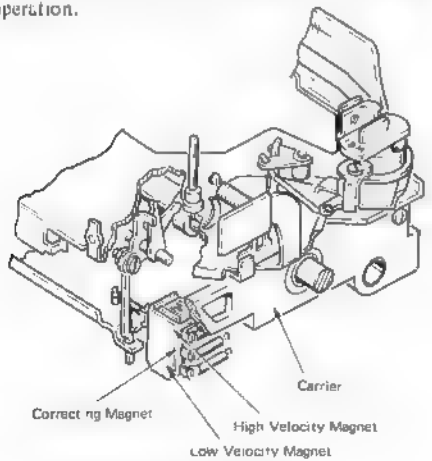


Figure 3 Velocity Control

A velocity slider moves left and right on the carrier bottom plate (Figure 4). A spring loads the slider toward the right. The rear of the slider engages the velocity cam follower roller to move it left and right.

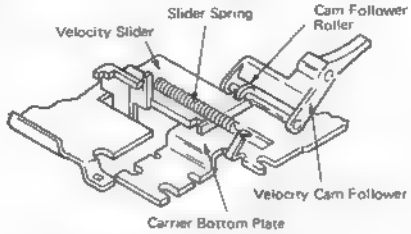
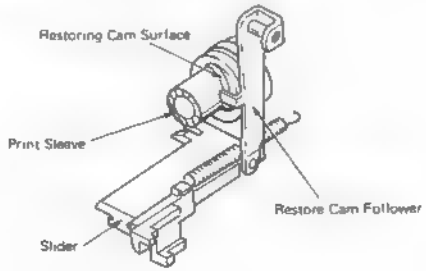


Figure 4 – Velocity Slider

In the rest position, the velocity slider is held to the left by the velocity restoring cam follower resting on the high surface of the restoring cam (Figure 5). The restoring cam surface is located on the left side of the high velocity cam on the print sleeve.



(Left Front View)

Figure 5 – Velocity Restoring Cam

As the print sleeve starts to rotate during a medium velocity print cycle, the high and low velocity magnets are energized, the restoring cam follower follows the cam to the low surface and the slider moves to the right until the roller aligns with the medium velocity cam surface (Figure 6). As the cam follower moves to the high surface of the restoring cam at the end of a print cycle, the velocity slider is restored to the left.

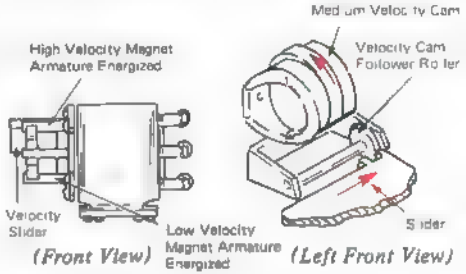


Figure 6 – Medium Velocity

When a no-print operation is required, no velocity magnets are energized. The velocity slider starts to move to the right as the cam follower moves off the high surface of the restoring cam. The slider and restoring cam follower are then prevented from moving to the right by the correcting magnet armature contacting a stop on the slider (Figure 7). The slider holds the roller to the left of the velocity cams.

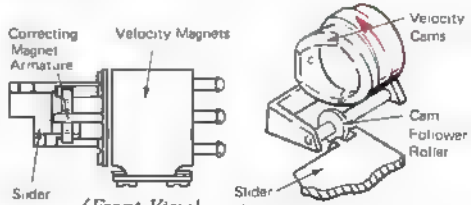


Figure 7 – No Print Velocity

When a high velocity character is to be printed, the high velocity magnet is energized (Figure 8). The slider will stop against the low velocity armature and the roller will align with the high velocity cam surface. The correcting magnet armature is also lifted out of the path of the slider by a lug on the correcting armature. One end of the lug extends up in front of the high velocity armature and the other extends down in front of the low velocity armature

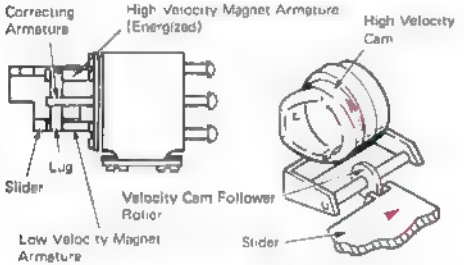


Figure 8 – High Velocity

When a low velocity character is printed, the low velocity magnet is energized (Figure 9). The slider will stop against the high velocity armature and the roller will align with the low velocity cam surface.

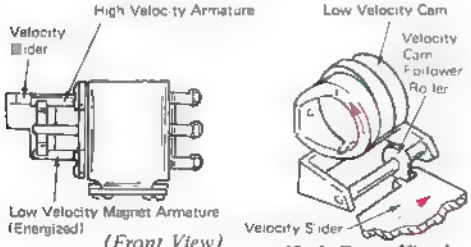


Figure 9 – Low Velocity

VELOCITY CHART

CHARACTER		VEL	CHARACTER		VEL
A	a	H/M	#	3	H/H
B	b	H/H	$	4	H/H
C	c	H/M	%	5	H/H
D	d	H/H	¢	6	M/H
E	e	H/M	&	7	H/M
F	f	H/M	"	8	M/H
G	g	H/H	(	9	M/H
H	h	H/H	)	0	M/H
I	i	M/M	¼	½	H/H
J	j	M/M	_	-	L/L
K	k	H/H	°	±	L/M
L	l	H/M	+	=	M/M
M	m	H/H	[	]	M/M
N	n	H/M	:	;	L/L
O	o	H/M	‘‘	'	L/L
P	p	H/H	¾	¾	M/M
Q	q	H/H	¶	§	H/H
R	r	H/M	.	.	L/L
S	s	H/M	,	,	L/L
T	t	H/M	?	/	M/M
U	u	H/H	CR		–
V	v	H/M	Shift	LC	–
W	w	H/H	Shift	UC	–
X	x	H/M	Index		–
Y	y	H/H	Backspace		–
Z	z	H/M	Spacebar		–
!	1	L/M	Tab		–
@	2	H/M			

VELOCITY MAGNET COMBINATIONS

VELOCITY	MAGNETS ENERGIZED
No Print	None
Low Velocity	V-2 (Lower Magnet)
Medium Velocity	V-1 and V-2
High Velocity	V-1 (Upper Magnet)
Correction Velocity	Center Magnet

Refer to the velocity chart for the velocity used for each character and function.

IMPRESSION CONTROL LEVER

The operator can change the position of the impression control lever to change the impression for all characters equally. The impression control lever is set in a detent plate to one of five impression positions (Figure 10). Changing the position of the impression control lever moves the pin at the lower part of the lever front or rear. The front-to-rear position of the pin determines the amount of motion the rocker receives from the print cam follower.

The distance that the velocity cams drive the rocker and typehead is called powered flight. The remaining distance that the typehead must move to reach the platen is called free flight. These two things determine the impression the typehead makes when the character impacts the paper. Free flight is necessary to produce a clear character image without smear.

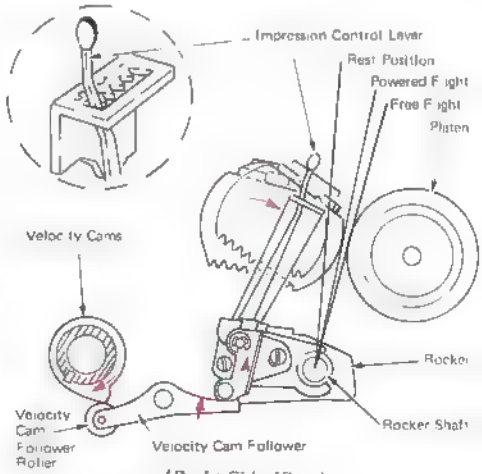


Figure 10 – Impression Control

PRINT FEEDBACK

The print feedback reed switch is located on a small board mounted on the left side frame, near the print shaft bearing (Figure 11) It is operated by a magnet fixed to the outside left end of the print shaft.

The feedback switch indicates to the logic board the rotational position of the print shaft. Most of the machine timing is based on this feedback to the logic board

The switch is open when the print shaft is in the rest position and closes for approximately 210 degrees during a print shaft cycle When the switch closes, it indicates that the print shaft has started a cycle. As the switch opens, it indicates when another operation may start.

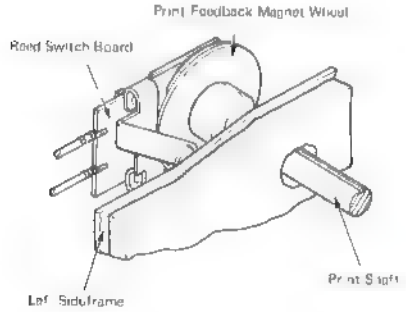
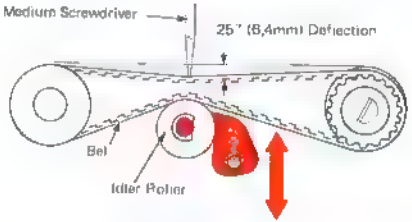


Figure 11 – Print Feedback

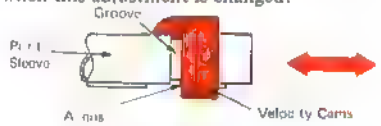
PRINT ADJUSTMENTS

1 *Print Shaft Belt Tension* – Adjust the idler roller for a belt deflection of .250" (6,4mm) when the medium screwdriver is placed on top of the belt.



2 *Velocity Cams* – Adjust the velocity cams left or right so that the low surface of the velocity slider restore cam aligns with the edge of the groove around the print sleeve

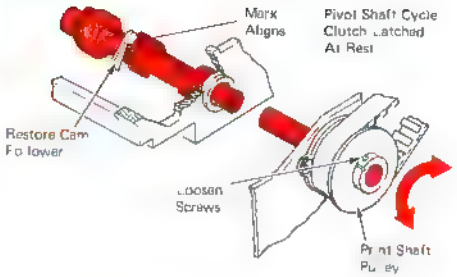
NOTE: Print sleeve end clearance and all the cams on the print sleeve may be affected when this adjustment is changed.



(Top View)

3 *Print Shaft Timing* – Adjust the print shaft rotationally so that the mark on the correcting restore cam aligns with the restore cam follower.

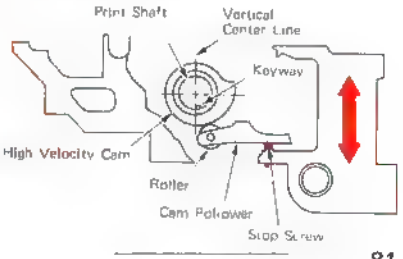
Loosen the print shaft pulley screws and ensure the print shaft cycle clutch is latched at rest during this adjustment. There should be an endplay of .002"-.004" (0,05-0,10mm) in the print shaft



4 *Velocity Cam Follower* – Adjust the follower stop screw so that the cam follower roller first contacts the high velocity cam when the front edge of the print shaft keyway is aligned with a vertical center line through the print shaft.

To make this adjustment, cycle a high velocity character until the front edge of the keyway is aligned with the vertical center line. Adjust the stop screw until it just contacts the follower

This may be observed and felt because the screw will start to move the rocker up once the screw contacts the cam follower.

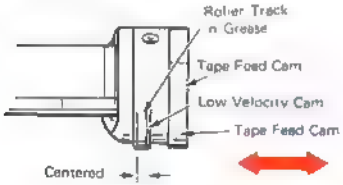


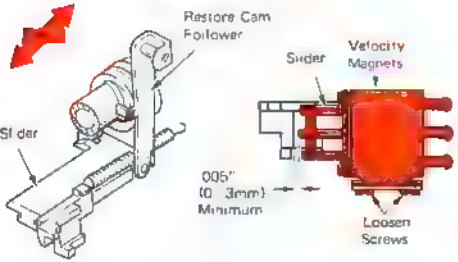
5. *Velocity Magnet Assembly (Left To Right)* – Adjust the velocity magnet assembly left and right so that the cam follower roller aligns with the center of the low velocity print cam surface when a low velocity character is selected

To check this adjustment, smear the cam surface with 23 grease and observe the tracks left by the cam follower roller.

This adjustment and adjustment 16 (Correcting Latch) in the Correcting Tape section affect each other and must both be revised until both are correct

NOTE: Ensure that after this adjustment is made, the velocity slider is restored a minimum of .005 (0,13mm) past the correcting magnet armature. It may be necessary to form the restore cam follower slightly for this condition



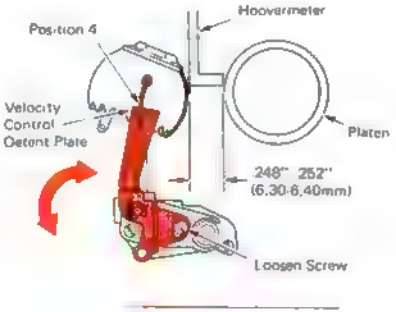


(Front Left View)

6. *Powered Flight* – Adjust the velocity control detent plate to allow .248"-.252" (6,30-6,40mm) between the center of the home character (zero) and the platen with the impression control lever in position 4

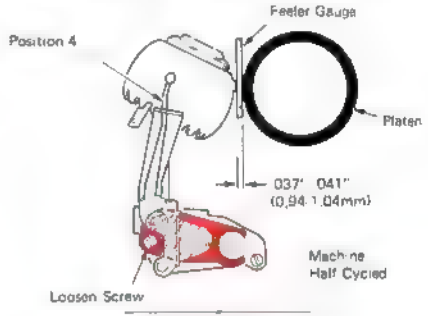
Use the base of the Hooverometer to set this clearance The base of the Hooverometer is .250" (6,35mm).

NOTE: Paper Feed Adjustments 1, 2 and 3 must be correct before making this adjustment. Adjustment 7 and 8 affect each other and must be revised until both are correct.

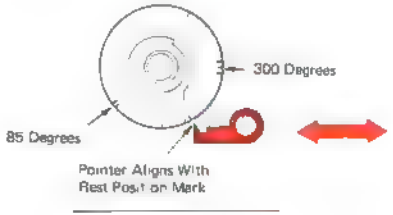


7. *Free Flight* – Adjust the velocity control plate for a clearance of .037"-.041" (0,94-1,04mm) between the home character (zero) and the platen with the impression control lever in position 4.

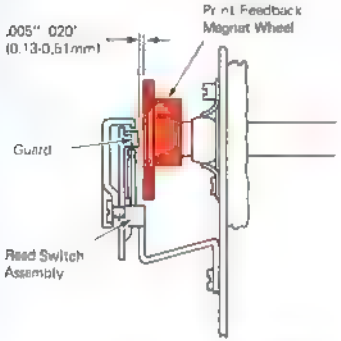
Check this adjustment with the machine half cycled and the print cam follower on the high surface of the medium velocity cam.



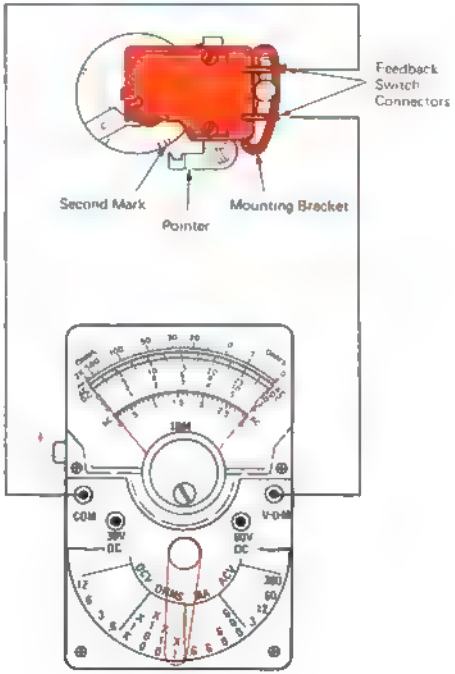
8. *Print Feedback Pointer* – Adjust the pointer to align with the rest position mark on the magnet wheel, with the print shaft in the rest position



9. *Print Feedback Magnet Wheel* – Adjust the wheel left or right to clear the guard on the reed switch assembly by .005"-.020" (0,13-0,51mm)



10 *Print Feedback Timing* – Adjust the reed switch mounting bracket vertically so that the switch opens as the second mark (300 degrees) aligns with the pointer. A VOM should be used to indicate the open or closed condition of the switch. Manually rotate the print shaft and observe the VOM as the timing mark passes the pointer



RIBBON OPERATIONAL THEORY

The purpose of the selective ribbon system is to lift and feed the film ribbon, correctable film ribbon or IBM Tech III ribbon. All three ribbons are contained in cartridges. The complete supply of ribbon is in the left side of the cartridge. The used ribbon is wound around the take-up core in the right side of the cartridge. The cartridge is scrapped when the ribbon is all on the right. The cartridges for the three types of ribbon look the same but have different colored knobs and leaders. Blue is used for IBM Tech III ribbon, pink for film ribbon and yellow for the IBM Correctable Film Ribbon (Figure 1). The film ribbons must be fed so that no characters overlap. The IBM Tech III ribbon is fed in much smaller amounts to use the restrike feature of this ribbon. The inner shape of the cartridge determines the amount of feed the mechanism will use.

A ribbon lift pattern of three tracks is used for all three ribbons.

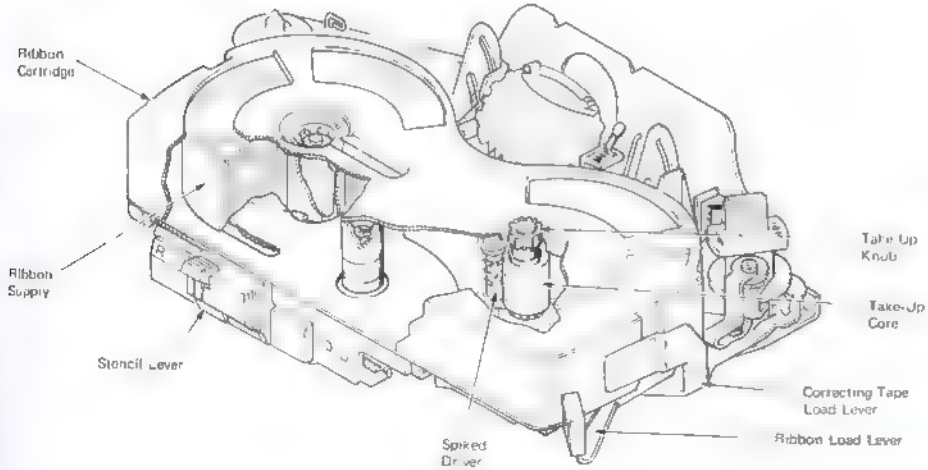
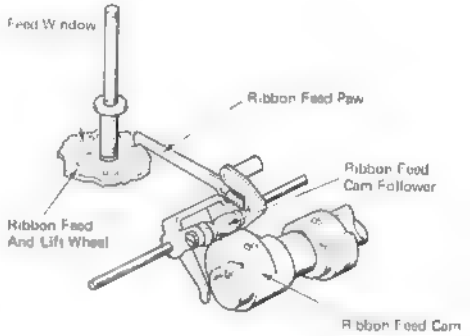


Figure 1 Selective Ribbon

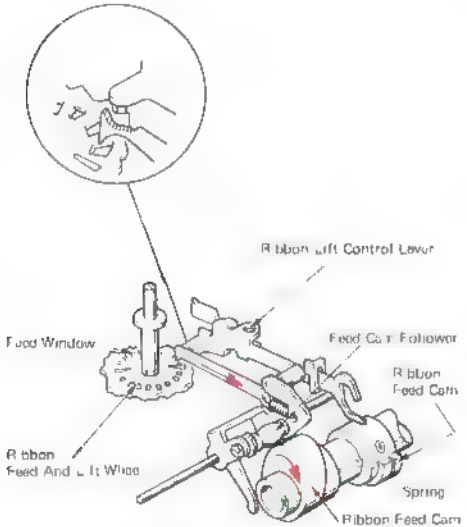
RIBBON FEED

Ribbon feed is performed by the ribbon feed cam follower assembly operating a ribbon feed pawl. During a print cycle, the ribbon feed pawl operates in one of the eighteen feed windows on the ribbon feed and lift wheel rotating it counterclockwise. At rest, the ribbon feed cam follower is on the high surface of the ribbon feed cam and the ribbon feed pawl is engaged in one of the feed windows (Figure 2).



(Right Rear View)
Figure 2 – Ribbon Feed Rest

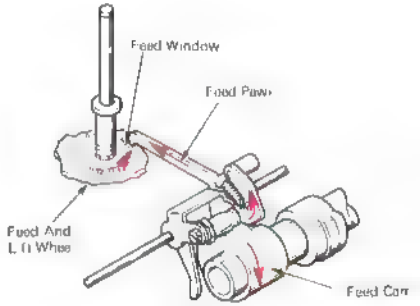
The ribbon feed cam follower is loaded by a spring against the ribbon feed cam. At the beginning of a print cycle, the cam follower moves toward the rear causing the ribbon feed pawl to cam out of the window of the ribbon feed and lift wheel. As the cam follower gets near the low surface of the cam, the pawl enters the next window to the rear. The ribbon feed and lift wheel is held detented by the ribbon lift control lever to prevent clockwise movement (Figure 3).



(Right Rear View)
Figure 3 Ribbon Feed Cycle

Near the end of the print cycle, the cam follower rises toward the high surface of the cam, moving the pawl toward the front of the machine. The pawl operates against the front surface of the window, rotating the ribbon feed and lift wheel in a counterclockwise direction (Figure 4).

At the completion of the print cycle, the feed cam follower is again on the high surface of the cam and the ribbon feed and lift wheel has been rotated 1/8 of a turn.



(Rear View)
Figure 4 Ribbon Feed Operating

The ribbon feed and lift wheel is mounted to the ribbon feed post with a hex head screw. The feed post is free to rotate within the ribbon feed swing arm. The ribbon feed swing arm pivots within a bearing in the ribbon plate (Figure 5).

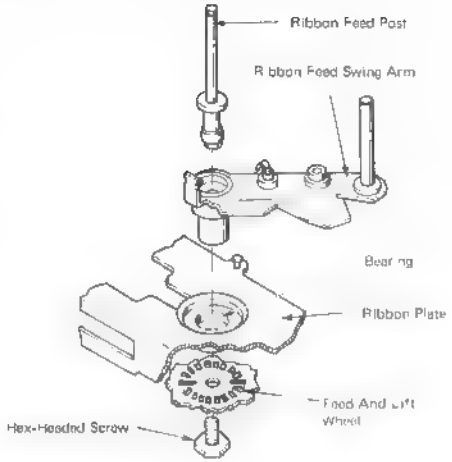


Figure 5 – Ribbon Feed Post

The rotation of the ribbon feed and lift wheel rotates the ribbon feed post. The ribbon feed gear, mounted on a flat surface of the feed post, also rotates (Figure 6). The spiked driver is mounted on a post at the rear end of the swing arm. Two intermediate gears mounted on the swing arm transfer the feed gear rotation to the spiked driver.

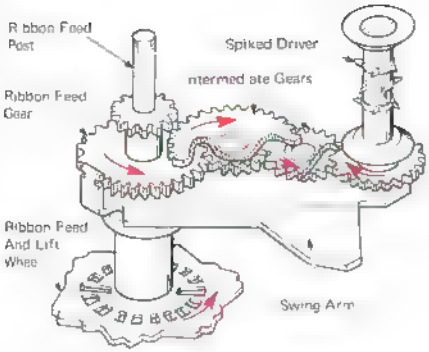


Figure 6 – Swing Arm

The swing arm has a heavy spring loading the rear end toward the ribbon take-up post (Figure 7).

This causes the spiked driver to engage the used ribbon. When the spiked driver rotates, it causes the take-up core to rotate on the take-up post pulling new ribbon into the print position and winding the used ribbon

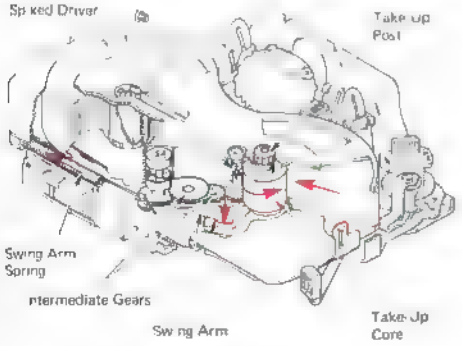
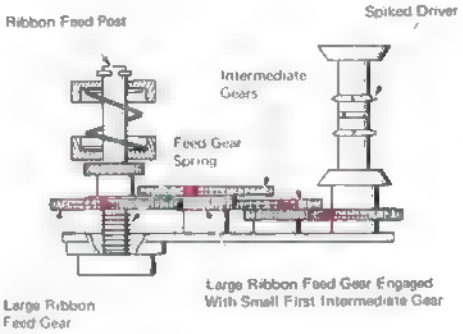


Figure 7 Ribbon Operation

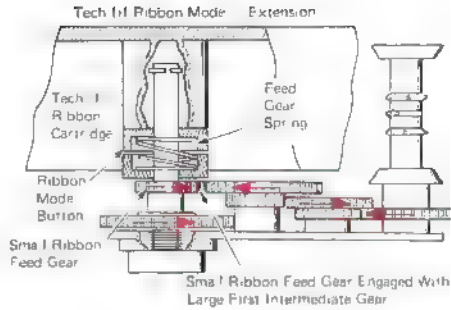
The amount of ribbon feed is controlled by the amount of spiked driver rotation during each print cycle.

The ribbon feed gear is free to slide vertically on the ribbon feed post. In the film ribbon mode, the large ribbon feed gear is engaged with the small intermediate gear. This causes the spiked driver to feed enough film ribbon so that the characters do not overlap (Figure 8).



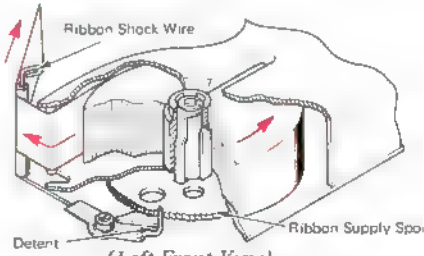
(Right Side View)
(Film Ribbon Mode)
Figure 8 – Ribbon Feed Gears

In the IBM Tech III ribbon mode, an extension within the cartridge depresses the ribbon mode button which, through the feed gear spring, depresses and holds down the ribbon feed gear. This allows the small ribbon feed gear to engage the large intermediate gear and causes the spiked driver to rotate approximately 1/6 as far as in the film ribbon mode (Figure 9).



(IBM Tech III Mode)
Figure 9 – Ribbon Feed Gears

A slight tension must be kept on the ribbon as it passes through the ribbon path so it will feed and track properly. This is done by the ribbon shock wire detent engaging the ribbon supply spool. The ribbon supply spool is not allowed to rotate until the ribbon applies enough tension on the shock wire to release the detent. As more ribbon is supplied, some tension is released from the shock wire, allowing the detent to relocate in the teeth of the supply spool (Figure 10).



(Left Front View)
Figure 10 – Ribbon Tension

RIBBON LIFT

The ribbons used with this mechanism are slightly less than 11/16" (17,5mm) wide. The mechanism uses three different ribbon lift positions. The ribbon lift mechanism includes a lift cam, lift cam follower assembly, lift control lever, lift arm and lift guide assemblies (Figure 11) The lift cam follower pivots above and to the rear of the lift cam. A lift spread adjusting plate is mounted to the cam follower by two small screws. A lug on the adjusting plate contacts the head of the height adjusting screw in the lift arm. As the cam follower is pivoted by the lift cam, it supplies vertical motion to the lift arm

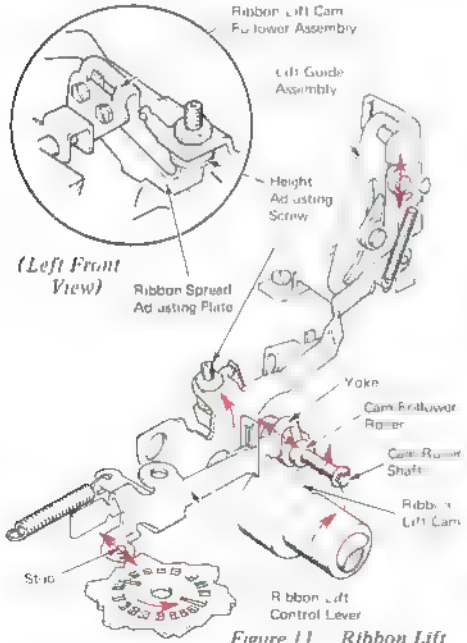


Figure 11 Ribbon Lift

The ribbon passes through the ribbon lift guides which move vertically in curved slots in the lift guide brackets The lift guides are connected to the lift arms by links. The lift arms and lift guides have lift guide bias springs to prevent small differences in ribbon lift (Figure 12)

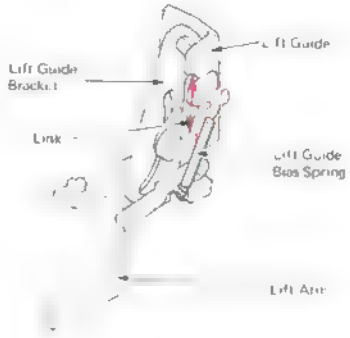


Figure 12 – Ribbon Lift Guide

The ribbon lift cam has three surfaces which provide the motion for three lift positions. The amount of motion that the lift cam follower receives is determined by the cam surface used (Figure 13).

The cam follower roller is free to slide on the roller shaft. The lateral position of the roller is controlled by a yoke on the ribbon lift control lever. A stud on the forward end of the ribbon lift control lever is loaded against the cam surface of the ribbon feed and lift wheel The ribbon feed and lift wheel cam surface has three different heights. As the ribbon lift control lever stud follows the feed and lift wheel cam surface, the yoke on the rear end of the lever positions the ribbon lift cam follower roller over one of the three ribbon lift cam surfaces. This changes the ribbon lift height for each cycle

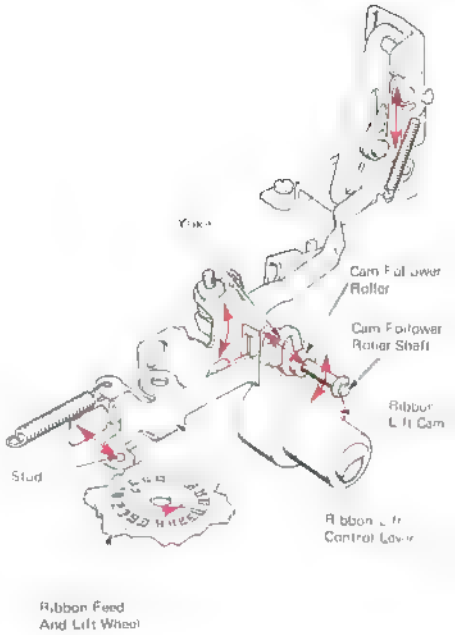


Figure 13 – Ribbon Lift Operation

In the IBM Tech III ribbon mode, the wobbler cam, the wobbler bellcrank and the wobbler eccentric slightly change the ribbon lift position (Figure 14). The left pivot point of the ribbon lift arm assembly is the wobbler eccentric. The wobbler eccentric has a vertical lug that extends above the surface of the ribbon plate. Moving this lug front-to-rear causes the wobbler eccentric to rotate, changing the left lift arm pivot point.

The wobbler bellcrank, operated by the wobbler cam, pivots on a stud on the ribbon plate. The tip of the left wobbler bellcrank arm rests in a notch in the vertical lug of the wobbler eccentric. The wobbler eccentric spring loads both the wobbler eccentric lug and the wobbler bellcrank arm toward the front

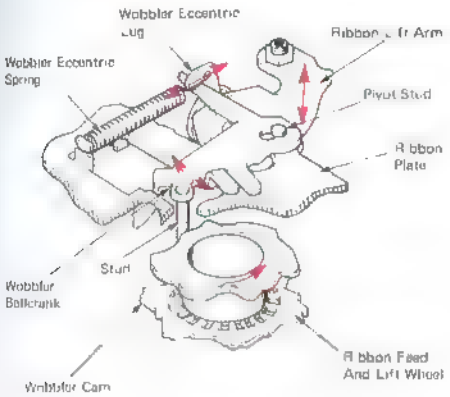
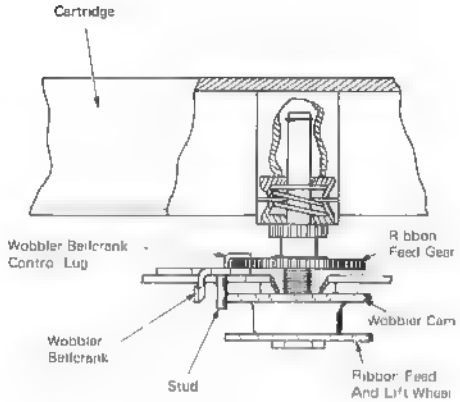
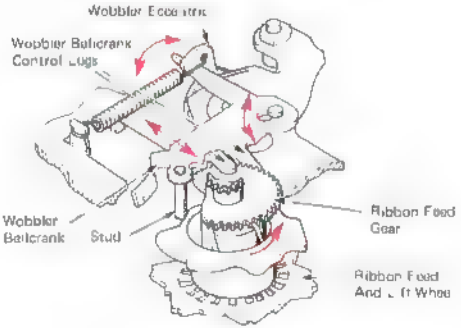


Figure 14 Wobbler Operation

The vertical position of the wobbler bellcrank is controlled by two lugs contacting the ribbon feed gear (Figure 15). When the feed gear is pressed down into the IBM Tech III ribbon mode by the cartridge, it also moves the wobbler bellcrank down into the operated position. When the wobbler bellcrank is in the operated position, a stud on the forward end of it follows the wobbler cam, which is mounted directly above and turns with the ribbon feed and lift wheel. The motion from the wobbler cam rotates the wobbler bellcrank, which operates the wobbler eccentric, causing a difference in the ribbon lift

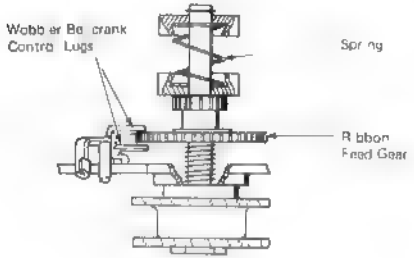


(Front View)

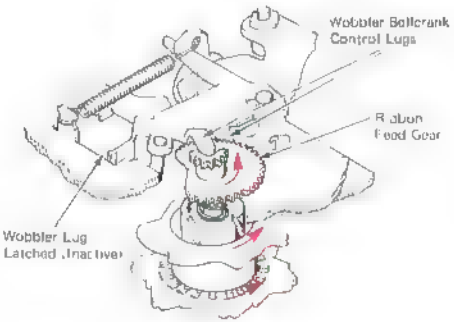


(Tech III Mode)
Figure 15 Feed Gears

When the mechanism is in the film ribbon mode, the feed gear is moved to the upward position by a spring (Figure 16). This allows a lug on the wobbler bellcrank to be latched against the ribbon plate, causing the bellcrank to be inactive



(Front View)



(Film Ribbon Mode)
Figure 16 Feed Gears

STENCIL MODE

When the typewriter is used for typing stencils, the ribbon feed and lift operations must be locked out (Figure 17). This is done by moving the stencil lever to the stencil position. The lever will latch in the stencil position and may be released by pushing the release button. A lug on the stencil lever contacts an extension on the front of the lift control lever, moving the rear of the lift control lever to the right. This moves the lift cam follower roller to the right of the lift cam.

When the lift control lever is in the stencil position, a feed lockout lug moves behind the feed pawl mounting stud. This prevents the feed pawl moving to the rear and inhibits ribbon feed.

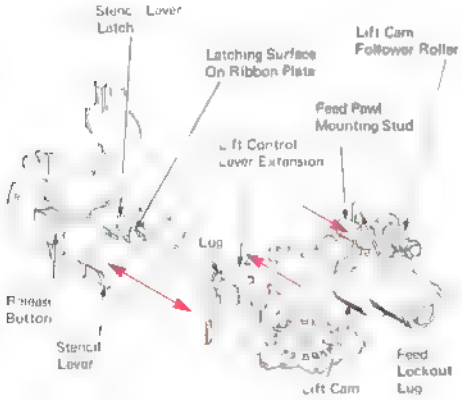


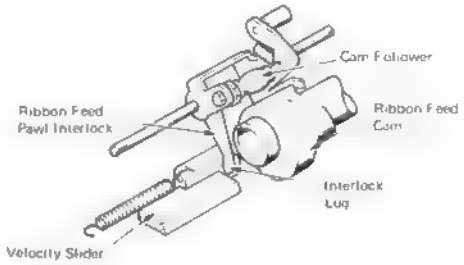
Figure 17 – Stencil Control

RIBBON FEED PAWL INTERLOCK

The ribbon feed pawl interlock prevents the ribbon feeding during a no-print operation.

The interlock is attached to the ribbon feed cam follower by a screw (Figure 18).

During a no-print operation, the interlock contacts the velocity slider. This prevents the feed pawl moving to the rear, and inhibits ribbon feed.

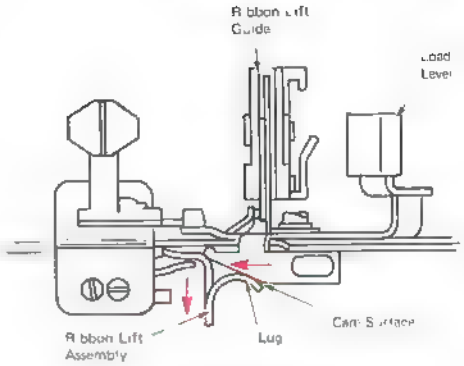


(Rear Right View)

Figure 18 – Ribbon Feed Pawl Interlock

RIBBON LOAD

When the ribbon needs to be changed, the load lever is moved to the load position at the left. A cam surface on the underside of the load lever contacts a lug on the right front of the lift arm assembly (Figure 19).



(Front View)

Figure 19 – Ribbon Load Lever

As the load lever is moved to the left, it pushes the front of the lift arm down and the lift guides up for ribbon installation (Figure 20).

During the loading of a ribbon, the operator must be prevented from turning the take-up core in the wrong direction. The take-up core interlock extends to the left from the right cartridge retaining spring. In the load position, the take-up core interlock engages the teeth on the take-up core, and prevents the core from being rotated in a clockwise direction. In the normal operating position, the take-up core interlock is held away from the take-up core by a lug on the load lever.

The load lever latch will not allow the load lever to restore to the operate position until a cartridge is installed. An installed cartridge depresses the latch and allows the load lever to be restored to the operating position.

A stud on the left side of the load lever contacts the right side of the swing arm. As the load lever is rotated, it pivots the swing arm to the load position.

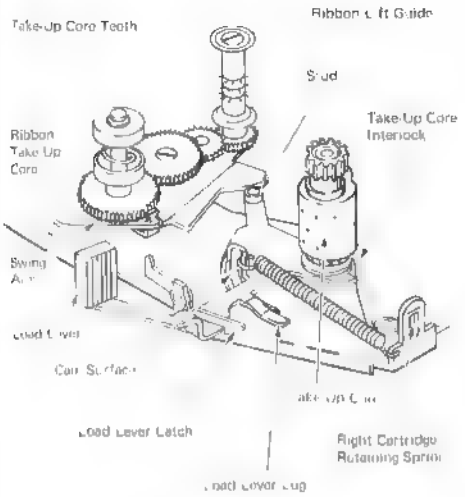


Figure 20 Ribbon Load

As the swing arm moves to the load position, it contacts the wobbler bellcrank, rotating it clockwise. This positions the wobbler bellcrank so that when it restores, it will reliably latch against the ribbon plate, if in the film ribbon mode or easily move down into the operated position, if in the IBM Tech III ribbon mode (Figure 21).

As the wobbler bellcrank rotates, it moves the vertical lug of the wobbler eccentric to the rear. The wobbler eccentric lug contacts the right arm of the shock wire disengage lever which pivots on the supply spool post. The left arm of the shock wire disengage lever pushes on a cam surface of the shock wire. As the left arm moves to the front, it releases the shock wire detent from the ribbon supply spool. This action is necessary to allow the operator to easily wind the leader on the take-up core when installing a ribbon.

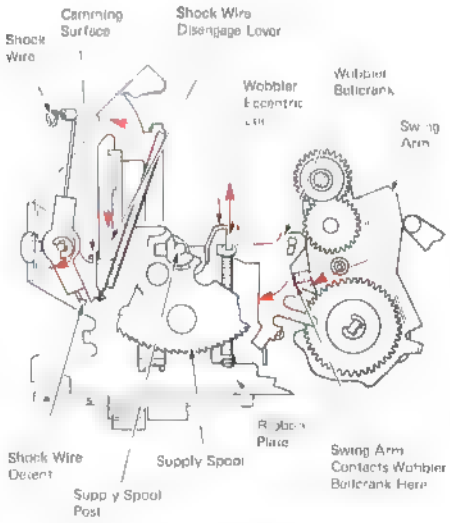


Figure 21 – Shock Wire (Load Position)

RIBBON ADJUSTMENTS

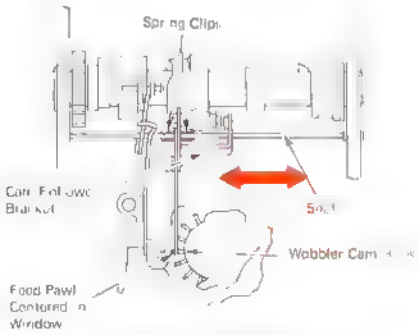
1. *Ribbon Feed Cam Follower Bracket*
   Adjust the ribbon feed cam follower bracket left or right so that the ribbon feed pawl is in the center of a feed window, with the pawl resting on the front edge of a window.

   The ribbon lift control arm should be detented in a low lift notch when checking this adjustment.

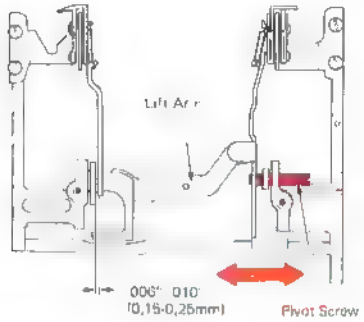
   After making this adjustment, ensure that the feed pawl will not bind against the wobbler cam hub and will not move past the outside limits of the feed window.

   The bracket is located on a shaft by two spring clips.

NOTE: Adjustments 1 and 2 of correcting tape must be correct before checking this adjustment.



2 *Ribbon Lift Arm* Adjust the right-hand lift arm pivot screw for .006"-.010" (0,15-0,25mm) end play of the lift arm. The end play must be maintained through the complete up and down movement of the lift arm.

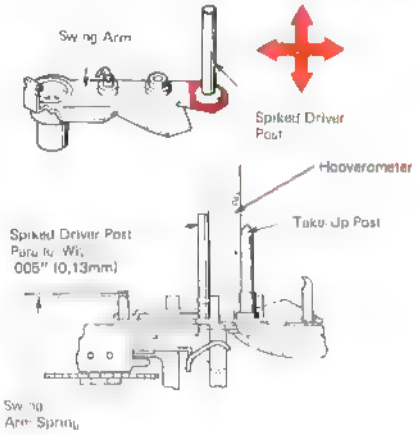


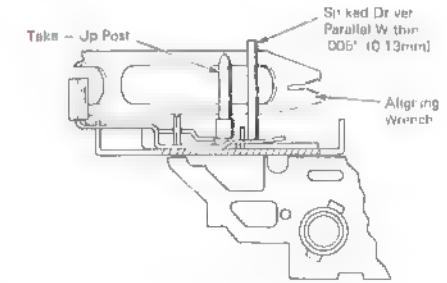
3 *Spiked Driver Post* Form the free end of the swing arm so that the spiked driver post is parallel to the take-up post. This must be checked in two directions, with the swing arm spring connected.

a Hold the Hooverometer edge flat against the take-up post. Allow the swing arm to close until the spiked driver post contacts the other edge of the Hooverometer. The spiked driver post should be parallel to the Hooverometer edge within .005" (0,13mm).

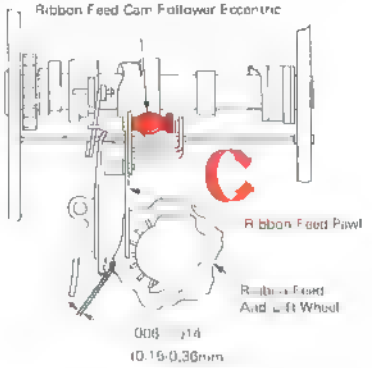
b Place a flat surface (such as an aligning wrench) against the take-up post and spiked driver post. The posts should be parallel within .005" (0,13mm).

The symptom of an "out of parallel" condition will be a bind within the cartridge caused by the ribbon winding unevenly. This will cause feed failures.





4 *Ribbon Feed Cam Follower Eccentric* Adjust the ribbon feed cam follower eccentric so that the ribbon feed pawl drives the ribbon feed and lift wheel .006"-.014" (0,15-0,36mm) past the detent point of the ribbon feed and lift wheel cam surface. The eccentric should be kept low and to the front.

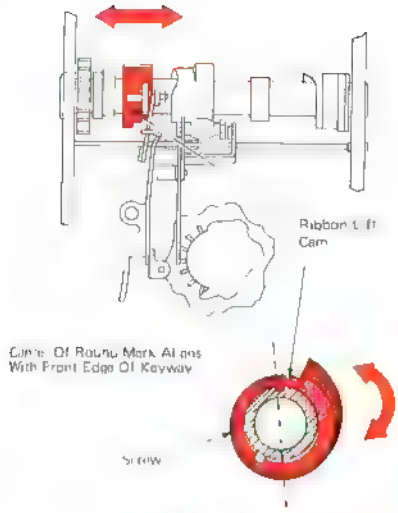


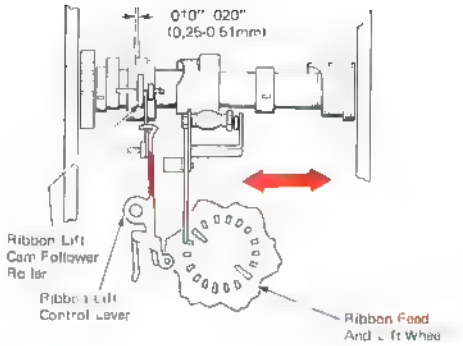
5 *Ribbon Lift Cam* – Adjust the ribbon lift cam for the following conditions.

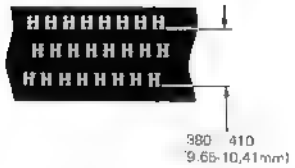
a. Left or right to clear the tape lift cam by .150"-.160" (3,81-4,06mm).

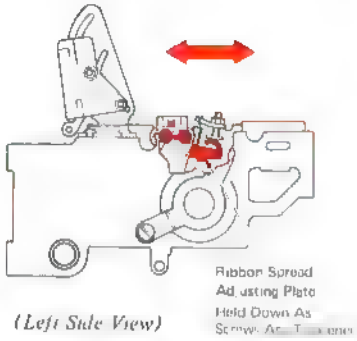
b. Radially so that the center line of the round timing mark on the cam aligns with front edge of the keyway in the print sleeve.

NOTE The setscrew in the cam may not align with the center of the flat surface on the print sleeve when this adjustment is correct.









(Left Side View)

6 *Ribbon Lift Control Lever* – Form the ribbon lift control lever so that the left edge of the ribbon lift cam follower roller is .010"-.020" (0,25-0,51mm) from the edge of the high lift cam, with the ribbon feed and lift wheel located in the medium lift position (center surface). This may be observed with power on by putting some grease on the ribbon lift cam and observing the roller track in the grease on the medium lift cam.

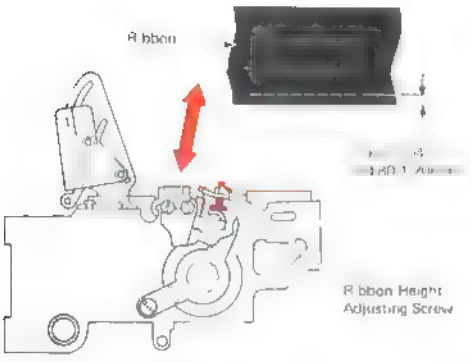
NOTE. If this adjustment requires more than .040" (1,02mm) change, the ribbon lift cam should be adjusted.

7 *Ribbon Spread Adjusting Plate* Adjust the ribbon spread adjusting plate front-to-rear to get .387"-.410" (9,83-10,35mm) between the bottom of the high lift characters and the bottom of the low lift characters in the film ribbon mode. This may be measured with the six-inch steel rule or the Hooverometer, which is .375" (9,52mm) wide. The ribbon spread adjusting plate must be held in a clockwise direction as viewed from the left when tightening the screws. This is easily done by tightening the screws with the machine half cycled. This takes out the play in the mounting holes in the direction of the lifting force and ensures that the adjustment does not change. Ribbon height must be checked after making this adjustment.

Results Of Improperly Adjusted
Ribbon Spread Adjusting Plate

9. *Ribbon Height* – Adjust the ribbon height adjusting screw so the bottom edge of the underscore impression on the ribbon clears the bottom of the ribbon by .032-.047" (0,80-1,20mm) in the film ribbon mode.

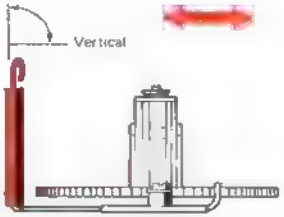
NOTE: This adjustment will affect adjustment 7 (Ribbon Spread Adjusting Plate).



(Left Side View)

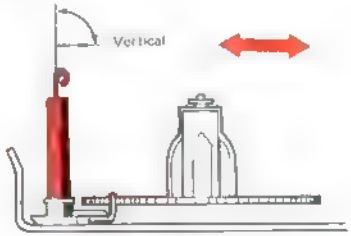
Results Of Improperly Adjusted Ribbon Height Adjusting Screw

6. *Ribbon Shock Wire* Form the shock wire to be vertical front-to-rear and left-to-right. This adjustment may need to be varied for proper tracking through the left ribbon lift guide.



(Front View)

Ribbon Shock Wire



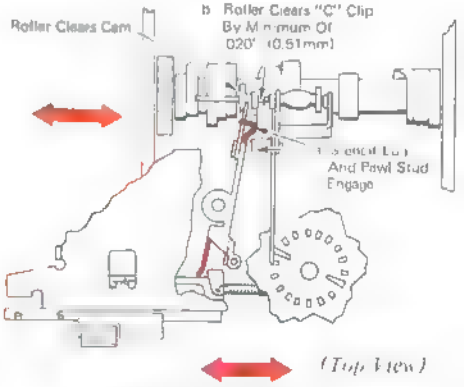
(Left Side View)

10. *Stencil Adjustment* Form the stencil lug on the ribbon lift control lever to meet two conditions when the stencil lever is latched in the stencil position.

a. The ribbon feed lockout lug must engage the ribbon feed pawl mounting stud by approximately the thickness of the lockout lug.

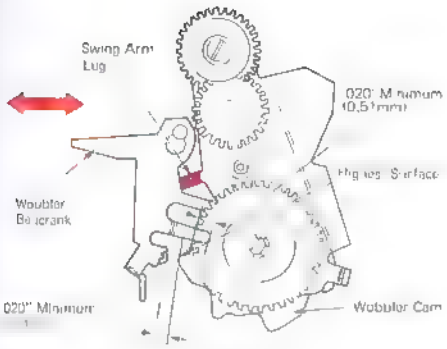
b. The ribbon lift cam follower roller must be moved to the right, completely off the ribbon lift cam, but still have a minimum of .020" (0,51mm) clearance between the roller and the C-clip at the end of the shaft.

NOTE: During normal typing in the low lift ribbon position the ribbon feed lockout lug on the ribbon lift control lever must clear the ribbon feed pawl mounting stud. If necessary, form the ribbon feed lockout lug to get this condition. If the lug is formed, recheck the stencil adjustments.



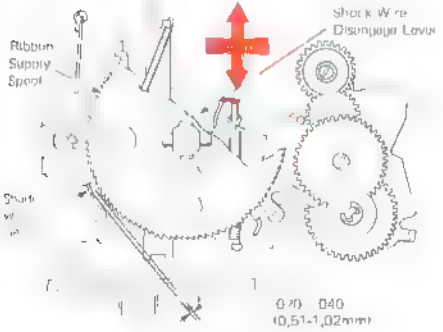
(Top View)

11. *Swing Arm Lug* Form the lug on the swing arm that contacts the wobbler bellcrank so the cam follower stud clears the highest surface of the wobbler cam by .020"-.032" (0,51-0,81mm) when the load lever is latched in the load position.



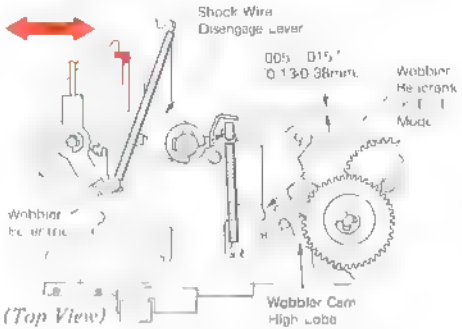
(Top View)

12. *Shock Wire Disengage Lever (Load Position)* Form the right-hand arm on the shock wire disengage lever so the shock wire detent clears the ribbon supply spool by .020"-.040" (0,51-1,02mm) with the lever in the load position. Ensure that the wobbler eccentric cannot get under the arm. If necessary, form the arm down.



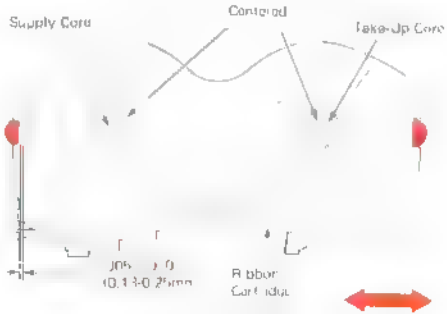
(Top View)

13. *Shock Wire Disengage Lever (Operate Position)* – Form the stop lug on the disengage lever for a clearance of .001"-.005" (0,03-0,13mm) between the disengage lever arm and the wobbler eccentric, with the wobbler bellcrank on the high surface of the wobbler cam and in the IBM Tech III ribbon mode.

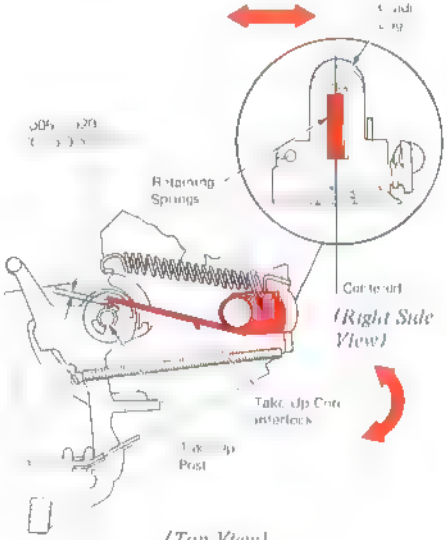


(Top View)

14. *Cartridge Guides* Form the cartridge guides to center the ribbon take-up and supply cores within the holes in the top of the cartridge. Maintain .005"-.010" (0,13-0,25mm) end play of the cartridge.



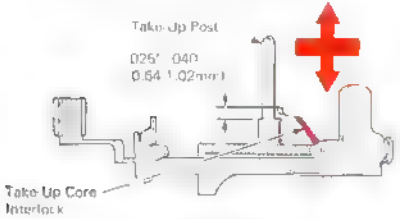
15 *Cartridge Retaining Springs* – Center the cartridge retaining springs in the holes in the cartridge guide lugs. Adjust the springs left-to-right so they positively hold the IBM Tech III ribbon cartridge down against the ribbon feed plate. The take-up core interlock must clear the center surface of the take-up post by .005"-.020" (0,13-0,51mm).



(Right Side View)

(Top View)

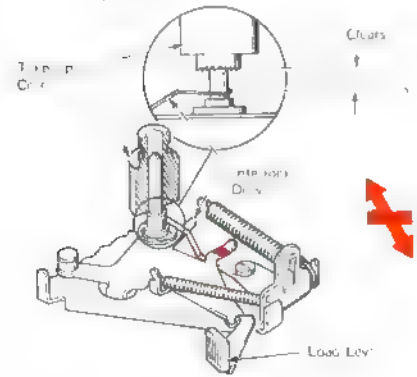
16. *Take-Up Core Interlock* Form the take-up core interlock so that in the load position the tip of the interlock is .025"-.040" (0,64-1,02mm) above the top edge of the center surface on the take-up post



(Right Front View)

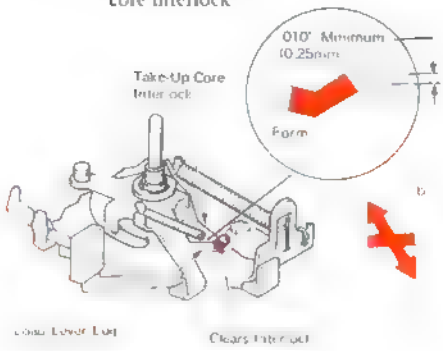
17. *Load Lever* Form the take-up core interlock lug on the load lever to meet two conditions

a. In the operate position, it must hold the take-up core interlock down completely disengaged from the take-up core



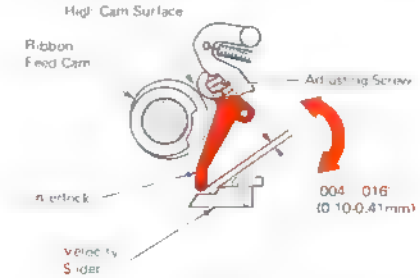
(Right Front View)

b. When the load lever is moved from load to operate, the tip of the lug must clear the top surface of the take-up core interlock

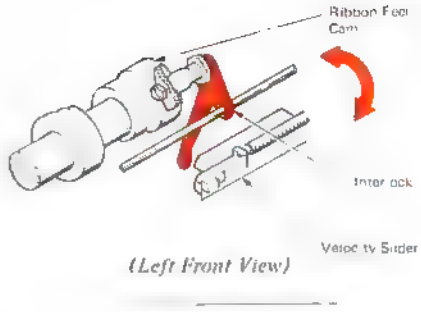


(Right Front View)

18. *Ribbon Feed Pawl Interlock* – Adjust the interlock so that it clears the velocity slider by .004"-.016" (0,10-0,41mm) with the ribbon feed cam follower on the high surface of the ribbon feed cam



(Left Side View)



(Left Front View)

CORRECTING TAPE OPERATIONAL THEORY

There are two types of correcting tapes available cover-up tape and lift-off tape. The cover-up tape is used with the IBM Tech III ribbon and the lift-off tape is used with IBM Correctable Film Ribbon

A correction operation begins when the backspace keybutton is depressed. The logic board first applies signals to the print shaft cycle clutch magnet, escapement magnet and the leadscrew drive magnets in the power module to move the carrier back to the character to be corrected. The logic board then signals the print shaft cycle clutch magnet again, and at the same time, energizes the correction magnet and the selection solenoids to correct the typed character. The character stored in the logic board is retyped with the correcting tape lifted between the ribbon and the paper. No escapement takes place during the correcting cycle The operator may then type the correct character or keep the backspace key depressed to remove the next character.

The purpose of the correcting tape mechanism is to lift and feed the correcting tape (Figure 1).

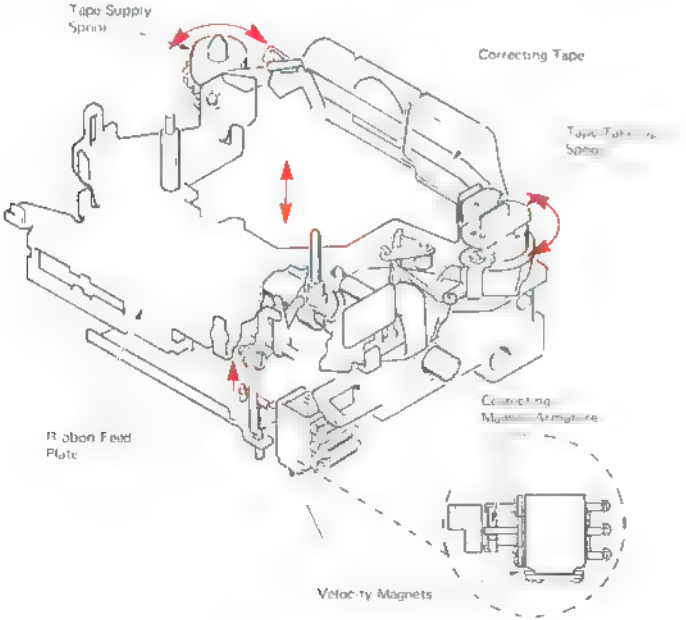
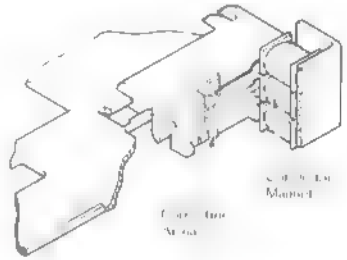


Figure 1 Correcting Tape Operation

CORRECTING MAGNET OPERATION

The correcting magnet is located between the high and low velocity magnets on the carrier bottom plate. During the correcting operation the print feedback contacts indicate to the logic board that the backspace operation is complete. The logic board then starts a print cycle and automatically selects the character to be corrected. At the same time, the logic board will energize the correcting magnet (Figure 2)

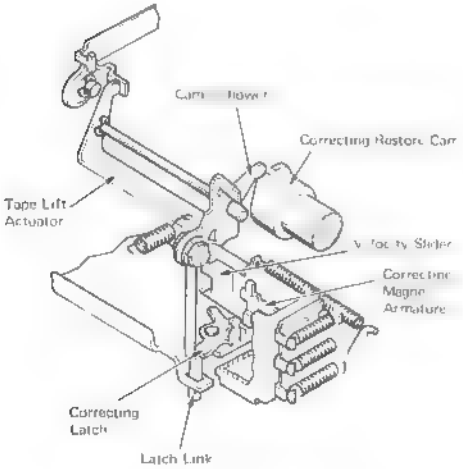


(Left Front View)
Figure 2 – Correcting Magnet

CORRECTING LATCH OPERATION

When the correcting magnet is energized, the armature moves toward the front of the machine and pivots the correcting latch (Figure 3). This allows the correcting link to move up and the tape lift actuator to pivot as the print sleeve rotates. As the tape lift actuator pivots, it performs two functions. One, it pushes the tape lift and latch assembly to the rear and positions the lift arm latch over the tape lift cam follower. This activates the tape lift mechanism.

Two, it unlatches the tape feed cam follower and allows the tape feed cam follower to move down and contact the tape feed cam. This activates the tape feed mechanism. The tape lift and feed mechanism operate as the print sleeve rotates.



(Right Front View)

Figure 3 Correcting Latch Operation

CORRECTING TAPE LIFT

When the print sleeve rotates, the tape lift cam rotates the tape lift cam follower and pushes the lift arm and latch assembly up (Figure 4). The rear of the lift arm moves the tape lift assembly up and places the correcting tape in front of the typehead. An arm on the tape lift assembly engages the tape supply cradle. As the lift assembly moves up, the cradle tilts and keeps the tape aligned with the supply spool. This prevents tape folding.

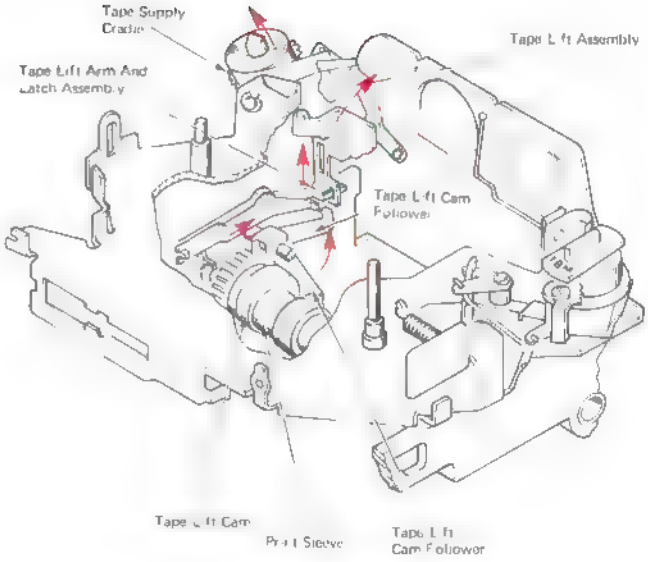


Figure 4 - Correcting Tape Lift

CORRECTING TAPE FEED

When the correcting latch is released and the tape lift actuator pivots toward the rear, a lug on the right end of the actuator rotates the tape feed latch. The latch surface is rotated out of the path of the tape feed cam follower, allowing it to follow the tape feed cam.

A spiked wheel is mounted on the tape feed swing arm and has a heavy spring loading it toward the take-up spool. This causes the spikes on the wheel to push into the used tape. As the spiked wheel rotates, it causes the take-up spool to rotate, pulling new tape into the correcting position and winding the used tape (Figure 5).

Motion for the feed is provided by a cam on the print sleeve. The motion is divided into two actions of the cam follower. The cam has two high surfaces and two low surfaces. The first high surface provides one third of the feed motion and takes place at the start of a correction cycle. This tightens the tape before the typehead prints. The divided feed distributes the load of tape feed away from the start of the correction cycle and ensures the lift-off tape does not stick to the cardholder as it is raised to the correcting position.

TAPE FEED OPERATION

As the tape feed cam follower moves to the first low surface of the cam, the rear lug on the follower moves forward. This allows the feed bellcrank and link to rotate the tape feed pawl counterclockwise, engaging a window in the spiked wheel (Figure 6).

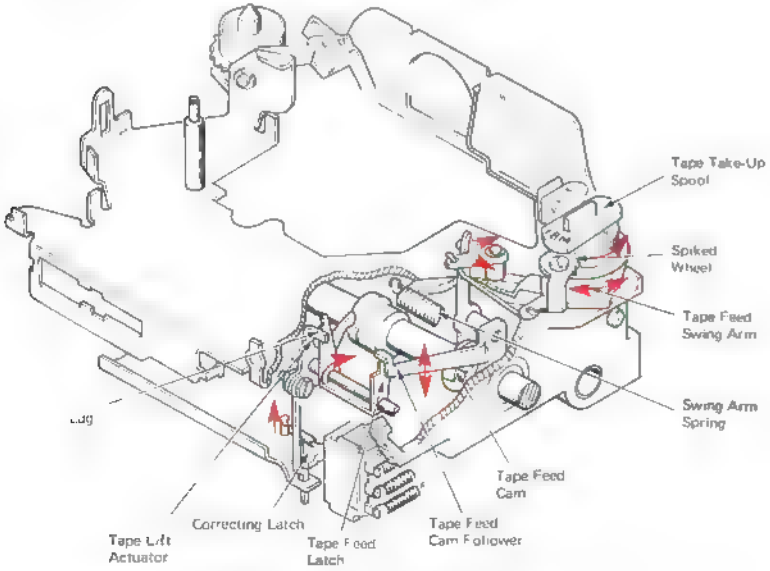
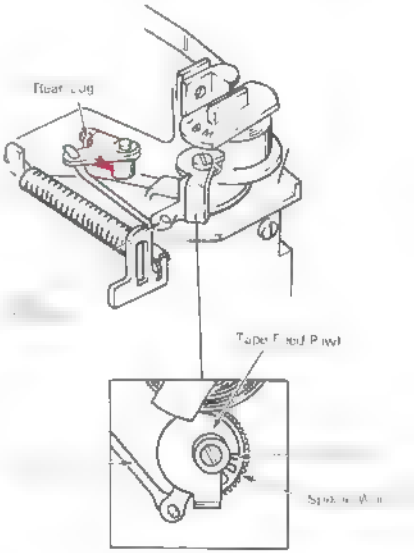
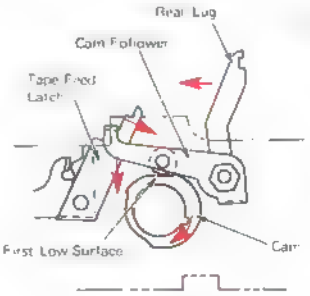


Figure 5 Correcting Tape Feed



(Top View)

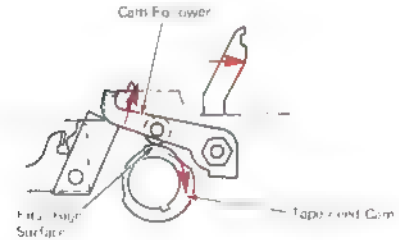


(Right Side View)

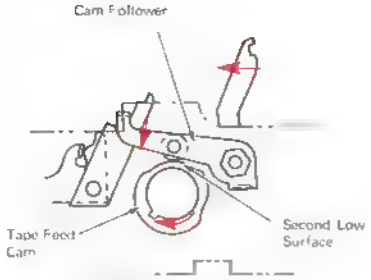
Figure 6 – Tape Feed

The tape feed cam then rotates to the first high surface (Figure 7a). The cam follower rotates to move the tape feed pawl and spiked wheel clockwise for the first one-third of the tape feed. The feed cam then rotates to the second low surface (Figure 7b). The second high surface then drives the cam follower and correcting tape the remaining two-thirds of tape feed (Figure 7c). The spiked wheel rotates clockwise a total distance of one window for each correcting operation.

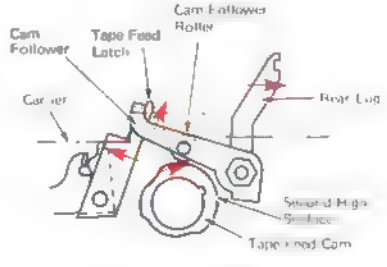
When the cam follower is on the second high surface of the cam, the tape feed latch clears the underside of the follower. If the next cycle is not a correction cycle, the cam follower will start to pivot and will contact the latch. The latch prevents the follower from pivoting enough to feed tape.



(First High Surface)
(Right Side View)
(a)



(Second Low Surface)
(Right Side View)
(b)



(Latched At Rest)
(Right Side View)
(c)

Figure 7 – Tape Feed Motion

A cam follower on the tape lift actuator will restore the actuator and latch the link under the correcting latch (Figure 8). The high surface of the correcting restore cam contacts the cam follower at the end of the print cycle.

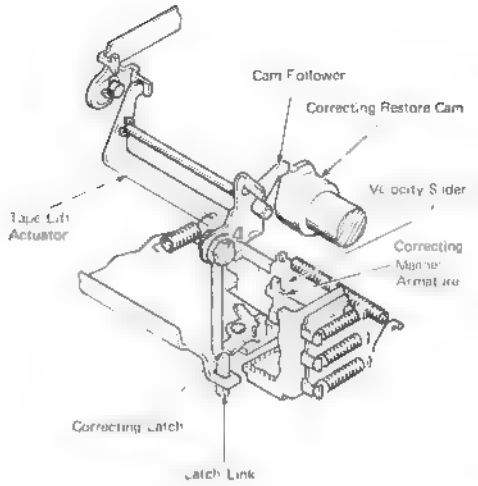


Figure 8 – Correcting Restore

TAPE BIAS SYSTEM

The correcting tape supply cradle assembly contains a bias system that performs three functions. First it supplies a low bias for use with the Tech III cover-up tape. Second, it supplies high bias for use with the lift-off tape. Third, it prevents the supply spool from being rotated clockwise.

As cover-up tape is being pulled off the supply spool and the tape supply spool ratchet turns counterclockwise, the teeth on the ratchet deflect the detent on the high bias spring (Figure 9). The low bias spring connected to the vertical lug on the sensing shoe arm is extended to produce the low bias on the ratchet.

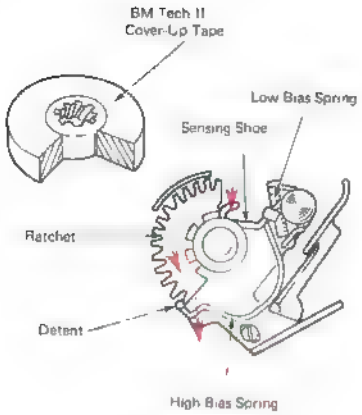


Figure 9 – Low Bias

When a lift-off tape is fitted on the machine, the sensing shoe comes in contact with lugs on the tape spool. As the detent is deflected over the teeth of the ratchet, the high bias spring must bend, so a high bias is applied to the tape spool (Figure 10). One lug on the bottom of the lift-off tape supply spool is shorter than the rest. It is shorter to allow the spool to engage completely with the supply spool ratchet in case the sensing shoe is under a window in the ratchet while the operator is loading the tape.

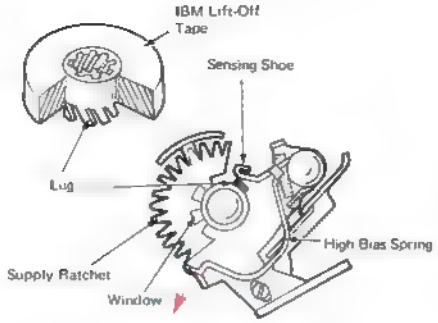


Figure 10 – High Bias

CORRECTING TAPE LOAD

When the correcting tape needs to be changed, the tape load lever is moved to the load (right) position (Figure 11). The load lever performs three functions to allow installation and removal of the tape.

It pivots the tape guide forward, the separator wire to the front, and the spiked wheel forward.

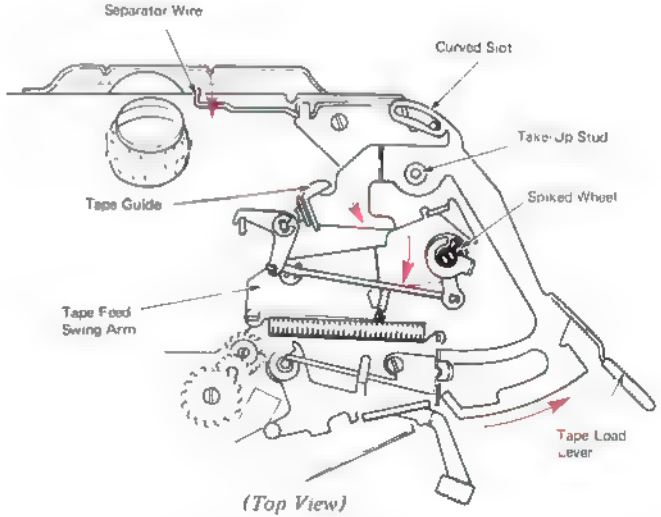
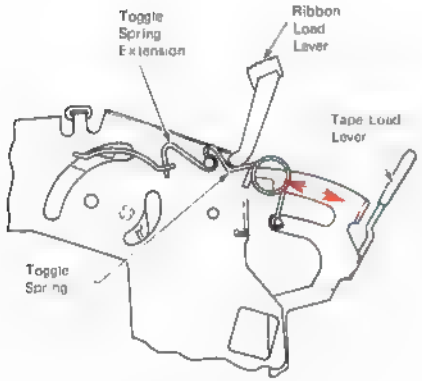


Figure 11 – Correcting Tape Load

LOAD LEVER INTERLOCKS

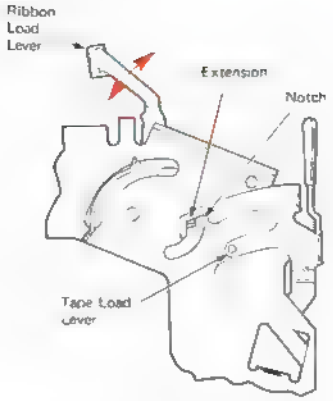
A toggle spring holds the tape load lever in either the load or type position (Figure 12a). An extension on the spring engages a hole in the ribbon load lever. This extension prevents the load lever moving while the tape lever is in the load position.



(Bottom View)

Figure 12a Ribbon Load Lever Interlocked

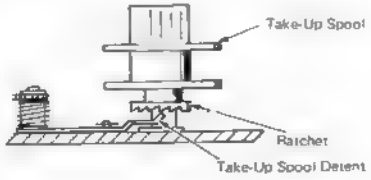
When the ribbon load lever is operated, an extension on the lever enters a notch in the tape load lever (Figure 12b). This prevents the tape load lever being moved to the right.



(Bottom View)

Figure 12b – Tape Load Lever Interlocked

To prevent the operator from turning the take-up spool in the wrong direction, a take-up spool detent engages a ratchet on the bottom of the take-up spool (Figure 13).



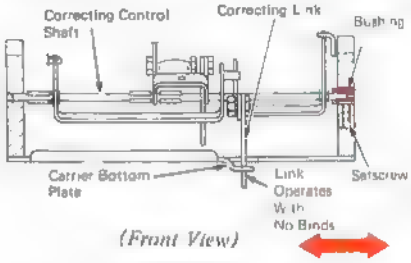
(Front View)

Figure 13 – Take Up Spool Detent

CORRECTING TAPE ADJUSTMENTS

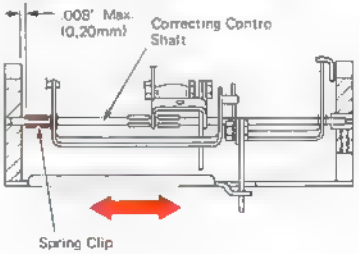
1. *Correcting Control Shaft* - Adjust the correcting control shaft left or right so that the correcting link is vertical and operates without binding in the carrier bottom plate

To change this adjustment, loosen the setscrew and position the bushing for the above conditions. Ensure that the shaft is to the right against the bushing when checking this adjustment.



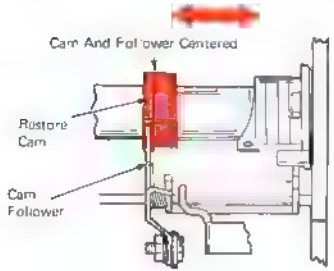
(Front View)

2. *Correcting Control Shaft End Clearance* Adjust the spring clip on the correcting control shaft left or right for a maximum end clearance of .008" (0,20mm).



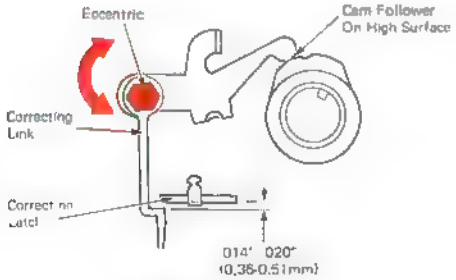
(Front View)

3. *Correcting Restore Cam* – Position the correcting restore cam left or right so that the cam follower is centered on the cam



(Top View)

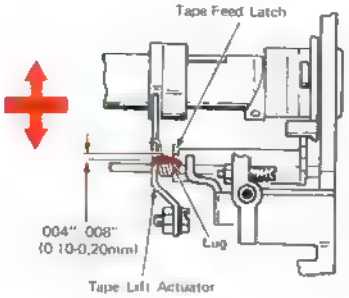
4 *Correcting Link* – Adjust the correcting link eccentric so that the link clears the correcting latch by .014"-.020" (0,36-0,51mm) with the tape lift actuator on the high surface of the restore cam.



(Right Side View)

5. *Tape Feed Latch* – Form the right-hand lug of the tape lift actuator to clear the tape feed latch by .004"-.008" (0,10-0,20mm) with the actuator in the latched position

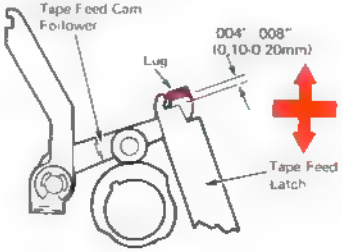
NOTE: Ensure that the correcting actuator is not on the high surface of the restore cam and is at rest on the correcting latch when checking this adjustment



(Top View)

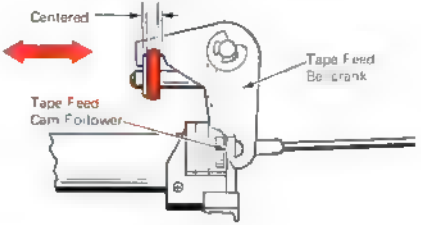
6. *Tape Feed Cam Follower* – Form the horizontal lug on the tape feed cam follower up or down to clear the stop on the tape feed latch by .004"-.008" (0,10-0,20mm).

The print shaft must be in the rest position when making this adjustment



(Left Side View)

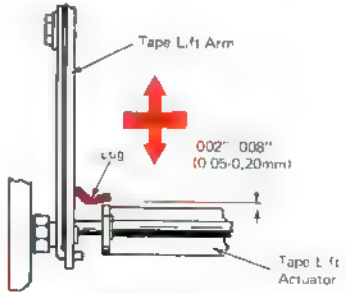
7. *Tape Feed Cam Follower Vertical Arm* Form the vertical arm on the tape feed cam follower left or right to align with the center of the notch in the tape feed bellcrank.



(Top View)

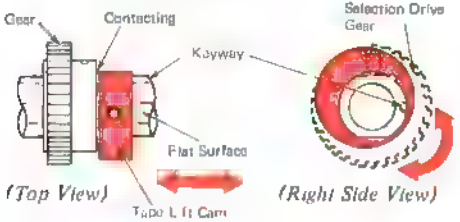
8. *Tape Lift Arm Lug* – Form the lug on the tape lift arm to clear the tape lift actuator by .002"-.008" (0,05-0,20mm) with the correcting actuator in the latched position.

NOTE: Ensure that the tape lift actuator is not on the high surface of the restore cam and is at rest on the correcting latch when checking this clearance.



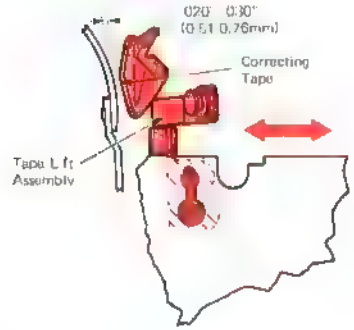
(Top View)

9. *Tape Lift Cam* Adjust the cam to the left to contact the selection drive gear. The cam setscrew must align with the flat surface on the top of the print sleeve The keyway on the print sleeve must be toward the rear when making this adjustment.



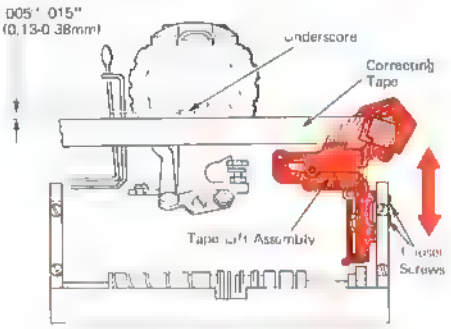
10. *Tape Lift Assembly* Adjust the tape lift assembly to satisfy the following conditions

a. Front-to-rear so that the tape clears the front of the cardholder by .020"-.030" (0,51-0,76mm). The tape supply cradle fork must be loose while making this adjustment.



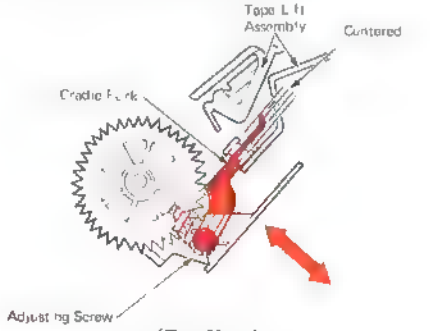
(Left Side View)

b. Vertically so that the bottom of the underscore clears the top of the tape by .005"-.015" (0,13-0,38mm) when the tape is at rest and the underscore is just above the tape during a print operation



(Rear View)

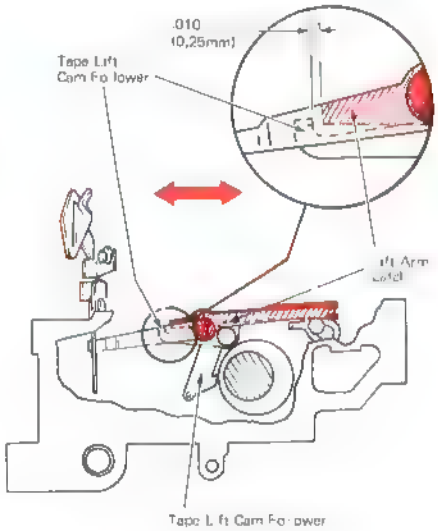
11. *Tape Supply Cradle Fork* - Position the cradle fork so that it centers in the surface of the stud mounted on the tape lift assembly



(Top View)

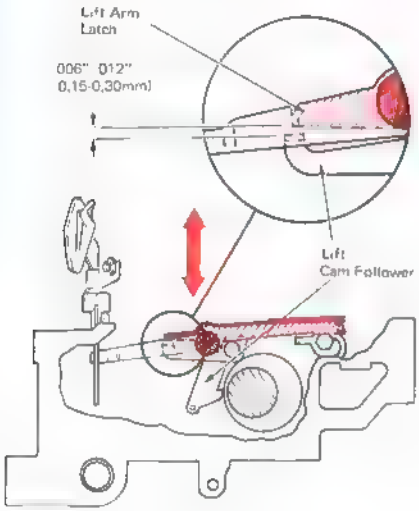
12. *Lift Arm Latch* Adjust the lift arm latch for the following conditions

a. Position the lift arm latch front-to-rear for a minimum clearance of .010" (0,25mm) to the tape lift cam follower, with the tape lift actuator latched and the restore cam follower away from the high surface.



(Left Side View)

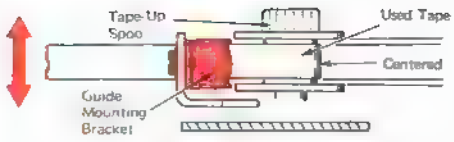
b. Position the lift arm latch vertically so that the bottom of the latch clears the lift cam follower by .006"-.012" (0,15-0,30mm) with the tape lift actuator cam follower on the low surface of the restore cam



(Left Side View)

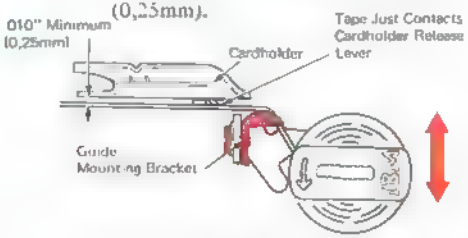
13. *Tape Guide* — Adjust the guide mounting bracket for the following conditions

a. Vertical — Position the bracket up or down so the used tape is centered on the take-up spool



(Front View)

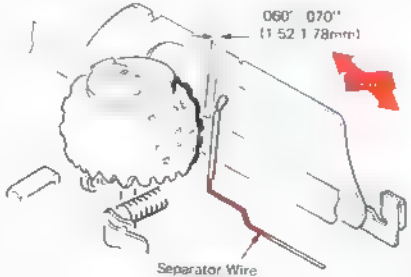
b. Front-To-Rear — Position the bracket front-to-rear so the tape clears the cardholder by .010" minimum (0,25mm).



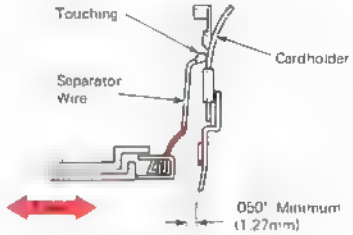
(Top View)

14. *Separator Wire* — Form the separator wire for the following conditions

a. Form the wire left or right so that the wire clears the typehead by .060"-.070" (1,52-1,78mm) when the typehead is in the print position and the tape load lever is in the type position



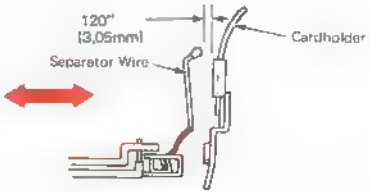
b. Form the wire so that the top of the separator wire just touches the cardholder while maintaining a minimum of .050" (1,27mm) clearance at the bottom of the vertical part of the separator wire with the tape load lever in the type position.



(Left Side View)

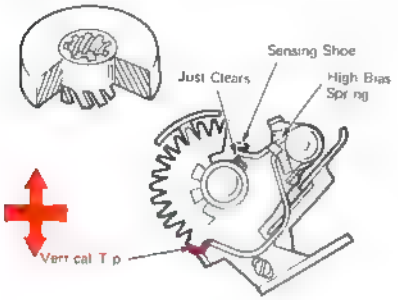
c. Form the wire so that the top of the wire clears the cardholder by .120" (3,05mm) with the load lever in the load position.

CAUTION: Do not type with the load lever in the load position. The typehead may hit on the separator wire and result in breakage of parts.



(Left Side View)

15 *High Bias Spring* — Form the vertical tip (detent) of the high bias spring in or out so that the sensing shoe clears the lugs on the tape supply spool when the mechanism is at rest

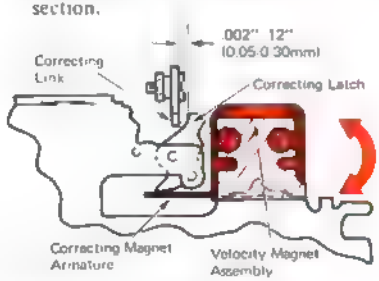


(Top View)

16. *Correcting Latch* — Adjust the velocity magnet assembly rotationally so that the correcting latch clears the correcting link by .002"- .012" (0,05-0,30mm) when the correcting and low velocity magnets are energized.

The machine should be hand cycled in a low velocity correcting mode until the velocity slider just contacts the armature of the high velocity magnet. The clearance may then be observed from the bottom with the machine in the tilted service position and the carrier at the right

This adjustment affects adjustment 5 Velocity Magnet Assembly in the print section.



(Bottom View)

CARDHOLDER OPERATIONAL THEORY

The purpose of the cardholder is to guide the paper around the platen as it is being fed into the machine. The cardholder also aids the operator in aligning the paper and positioning the carrier on the writing line. The cardholder also holds the print shield. The print shield is not fitted as a standard feature, but it may be used to prevent side printing in certain applications

The cardholder can be easily removed by depressing the cardholder load lever, which pivots on the right of the cardholder mounting bracket (Figure 1). As the lever is depressed, a stud on the rear pulls the cardholder to the right An extension on the left of the load lever rotates in an upward direction, contacts the cardholder and pushes it up. The cardholder may then be lifted from the machine. To reinstall the cardholder, engage the left-hand slot on the holder with the left mounting stud on the cardholder bracket. The right-hand slot on the cardholder will now be located above the stud on the load lever Push on the top right of the cardholder and it will lock down into position.

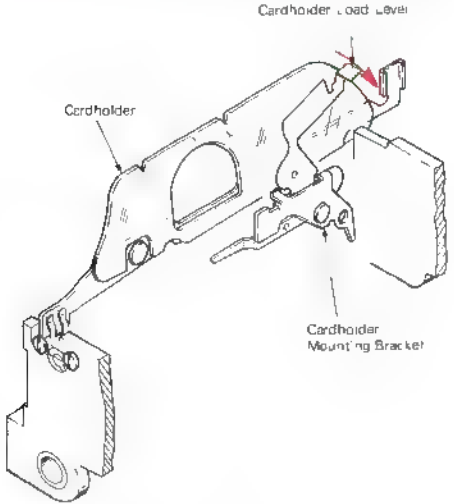


Figure 1 Cardholder

In some machine applications, a cardholder with a print shield may be installed. The print shield covers most of the opening in the center of the cardholder. A small hole in the shield allows the selected character on the typehead to strike the paper (Figure 2).

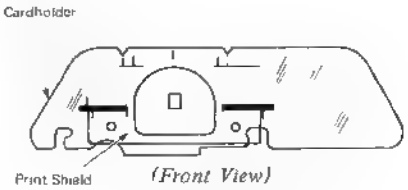
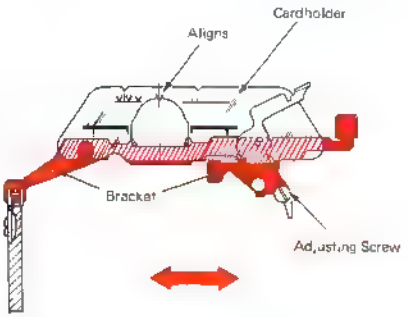


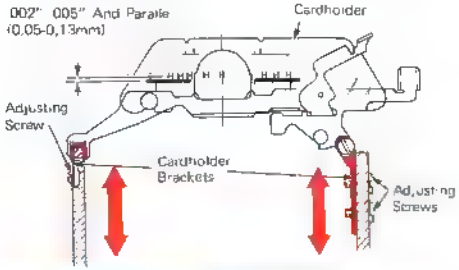
Figure 2 Print Shield

CARD HOLDER ADJUSTMENTS

1. *Cardholder (Left-To-Right)* Adjust the cardholder bracket so that the center line on the cardholder aligns with the point of the character "V" in 10 and 12 pitch



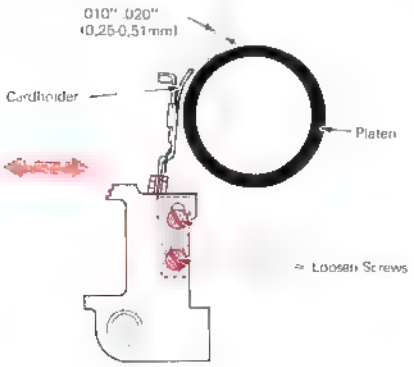
2. *Cardholder Height* Adjust the cardholder brackets for a clearance of .002"-.005" (0,05-0,13mm) between the horizontal line and the bottom of some typed characters The line should be parallel to the bottom edge of the characters



3 *Cardholder Clearance* Adjust the cardholder brackets front-to-rear for a clearance of .010" 020" (0 25-0,51mm) between the cardholder and the platen.

This clearance is measured at the closest point on each side of the cardholder

NOTE. If this adjustment is changed, tape lift assembly (Adj 10a) and tape guide (Adj 13b) must be checked



(Right Side View)

The leadscrew is located in bearings behind the carrier, near the rear carrier rail (Figure 1)

The leadscrew drives the carrier left or right The motion to rotate the leadscrew is provided by the leadscrew drive mechanism in the power module and as discussed in the Leadscrew Drive section The escapement mechanism is located at the left end of the leadscrew

The escapement mechanism controls the amount of leadscrew rotation, therefore, it controls the left and right spacing of the carrier

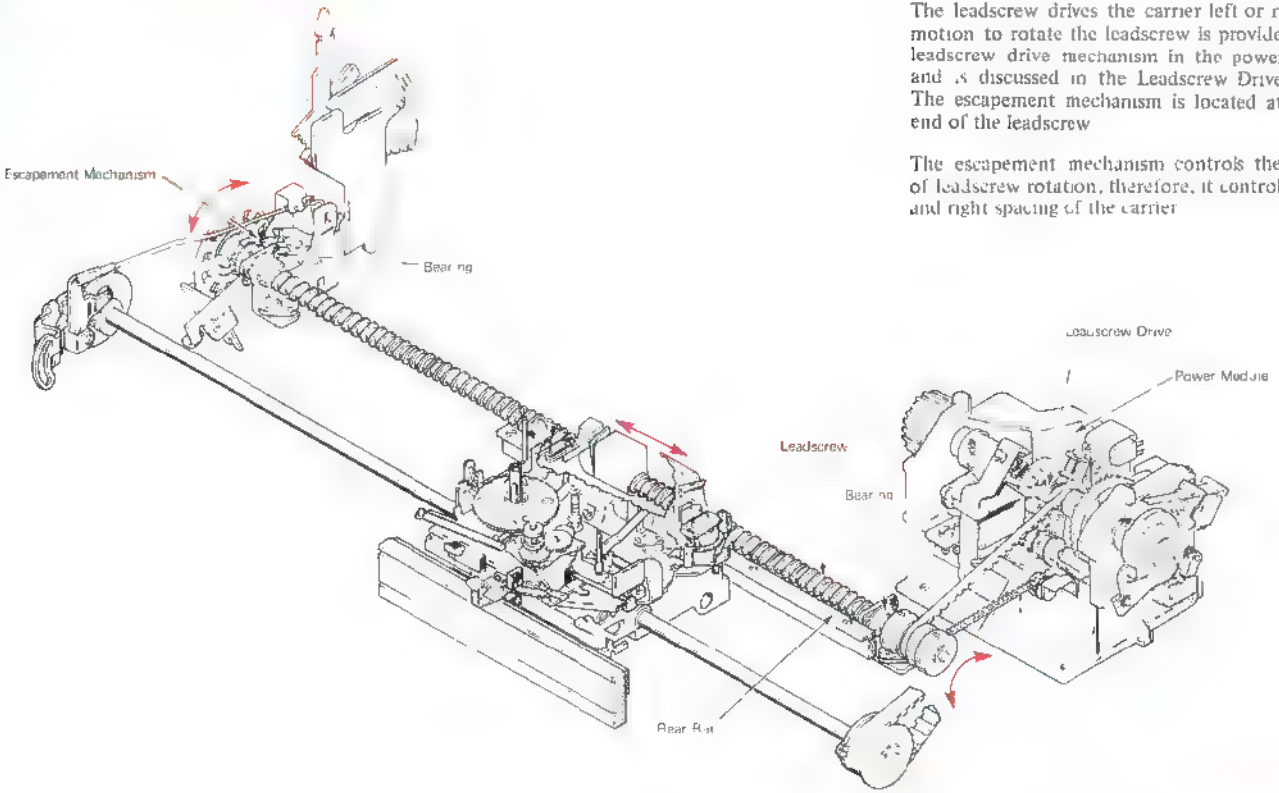


Figure 1 Leadscrew Escapement

The leadscrew drive belt transfers motion from the power module to the leadscrew pulley on the torque limiter (Figure 2).

The torque limiter drives the leadscrew and is a safety device to limit the torque input to the leadscrew. It slips to prevent damage to the escapement mechanism, power module and carrier if lateral movement of the carrier is prevented while the power module is driving. A bind in the rotation of the leadscrew will also cause the torque limiter to slip.

The leadscrew nut is a molded part with an internal thread which is constantly engaged with the leadscrew (Figure 3). The nut is mounted on the rear of the carrier and transfers the rotational motion of the leadscrew to lateral motion of the carrier. The leadscrew lock is similar to the nut and is discussed in the Fine Alignment section of this manual.

The direction of the leadscrew rotation determines the left or right movement of the carrier. Top to front leadscrew rotation causes the carrier to move to the right. Top to rear leadscrew rotation causes the carrier to move to the left.

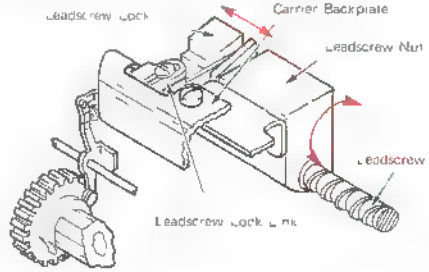


Figure 3 Leadscrew Nut

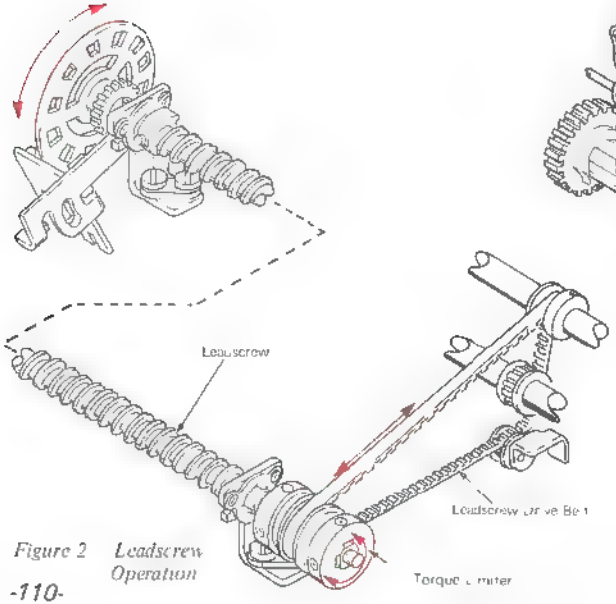


Figure 2 Leadscrew Operation

CARRIER MOVEMENT CONTROL

The escapement mechanism holds the leadscrew position at rest, releases the leadscrew when carrier movement is required and stops the leadscrew when the carrier has moved to the required position. These operations take place each time the carrier moves. That is: during space, backspace, tabulation and carrier return. The only difference between these four functions is direction, speed and distance. These functions are controlled by logic board signals to the cycle clutch, the power module and the escapement mechanism (Figure 4).

To begin carrier movement in either direction, the logic board applies a signal to the print shaft cycle clutch magnet. The cycle clutch then rotates the print shaft 360 degrees. This releases the leadscrew (discussed in this section). The leadscrew drive magnets (discussed in Leadscrew Drive section) are then energized by the logic board, and the leadscrew rotates.

When the carrier is in the correct position, the leadscrew drive magnets are de-energized. The leadscrew is then stopped and held by the escapement mechanism.

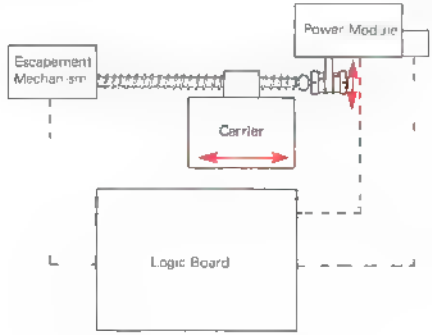
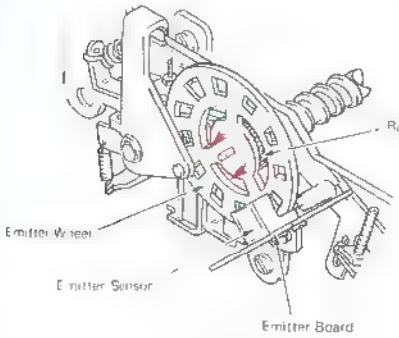


Figure 4 Carrier Control

ESCAPEMENT MECHANISM

The escapement mechanism consists of a leadscrew ratchet and emitter wheel on the left end of the leadscrew and a mechanism to hold and release the ratchet (Figure 5).

The emitter wheel and emitter provide electrical signals to the logic board (explained in this section). The emitter sensor indicates to the logic board when the leadscrew is rotating, and how much it has rotated.



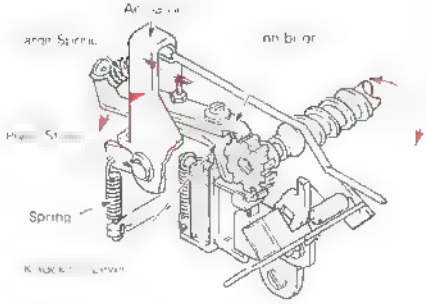
(Left Front View)

Figure 5 Escapement Mechanism

The escapement actuator pivots on a stud on the left side of the machine and is spring loaded to the rear (Figure 6).

Also on the pivot stud is the escapement inhibitor assembly and the knockoff lever.

At rest, these three parts — actuator, inhibitor assembly and knockoff lever — are held together by a large spring.

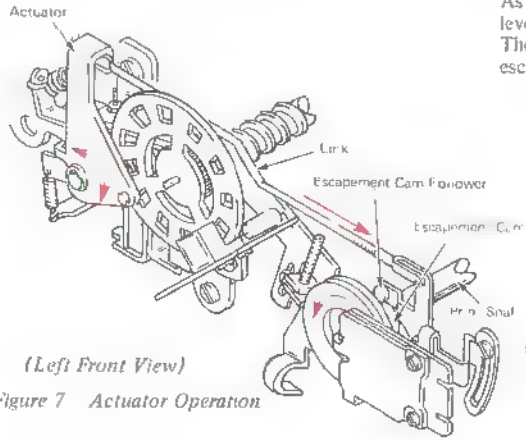


(Left Front View)

Figure 6 Escapement Actuator

ESCAPEMENT ACTUATOR OPERATION

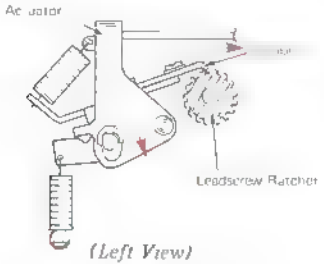
The escapement cam on the left end of the print shaft operates the escapement cam follower. The motion of the cam follower is transferred to the escapement actuator by a link. (Figure 7). Each time the print shaft rotates, the actuator pivots forward, then back to the rear (rest position).



(Left Front View)

Figure 7 Actuator Operation

As the actuator pivots, the inhibitor assembly also pivots until the inhibitor contacts the leadscrew ratchet (Figure 8).

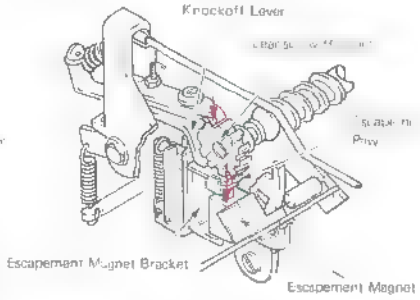


(Left View)

Figure 8 Inhibitor Operation

The escapement magnet is mounted on a bracket below the leadscrew ratchet (Figure 9). The escapement magnet armature has a vertical lug at the left that engages the ratchet. The other end of the escapement pawl. The pawl is spring loaded down at the rear.

As the actuator and inhibitor pivot, the knockoff lever also pivots. The knockoff lever also pivots. The knockoff lever contacts the top surface of the escapement pawl and moves it down.

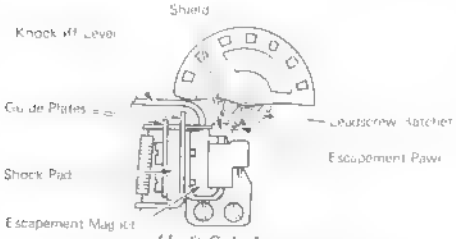


(Left Front View)

Figure 9 - Escapement Magnet

The escapement pawl is located front-to-rear by two guide plates (Figure 10). The plates are separated by a shock pad which absorbs the momentum of the ratchet, emitter wheel and leadscrew as the pawl re-enters the ratchet teeth.

A small shield on the escapement pawl prevents contamination of the magnet air gap.

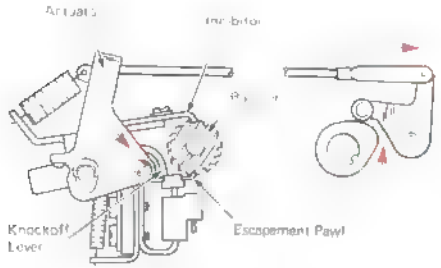


(Left Side View)

Figure 10 Escapement Pawl And Magnet

LEADSCREW RATCHET RELEASE

As the actuator and inhibitor assembly pivot down, the knockoff lever moves down toward the escapement pawl (Figure 11). The inhibitor enters between the ratchet teeth and stops against the ratchet.



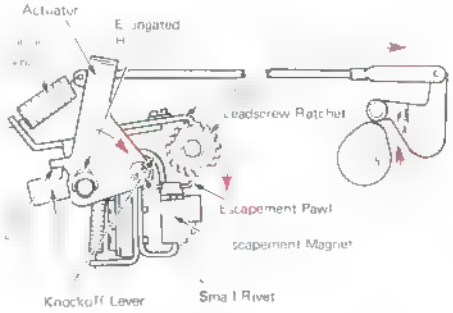
(Left Side View)

Figure 11 – Escapement Operation

Although the actuator continues to pivot, the inhibitor cannot, so the large spring expands.

Further motion of the actuator pivots the knockoff lever down to contact the escapement pawl which moves down from between the ratchet teeth (Figure 12).

When the escapement pawl contacts the escapement magnet, the actuator pivots on the small rivet in the knockoff lever. The pivot stud hole in the actuator is elongated, so when the knockoff lever stops against the escapement pawl and magnet, the large spring expands further. Since the actuator is now pivoting on the rivet, the stop lug at the rear moves up, away from the knockoff lever.



(Left Side View)

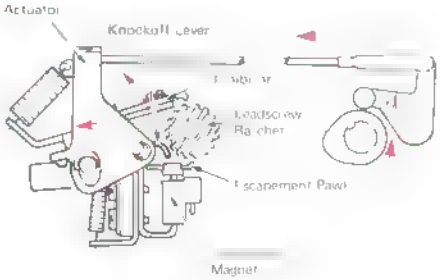
Figure 12 Escapement Pawl Release

If the leadscrew is to rotate at this time, the logic board will now energize the escapement magnet. The magnet will hold the escapement pawl out of the ratchet while the actuator, knockoff lever and inhibitor pivot back to the rest position with the escapement pawl disengaged and the inhibitor at rest. The leadscrew may be rotated forward or reverse by the power module (Figure 13). The logic board energizes the leadscrew drive magnets and the carrier moves.

When the leadscrew has rotated the correct amount, the drive magnets and the escapement magnet are de-energized. The escapement pawl enters between the ratchet teeth and the leadscrew stops rotating.

During a print shaft cycle when no carrier movement is required, the escapement magnet does not energize. The escapement pawl reenters the ratchet as the knockoff lever moves up, so the ratchet is not released.

The escapement inhibitor does not disengage the ratchet until after the escapement pawl has reengaged the ratchet.



(Left Side View)

Figure 13 - Leadscrew Ratchet Released

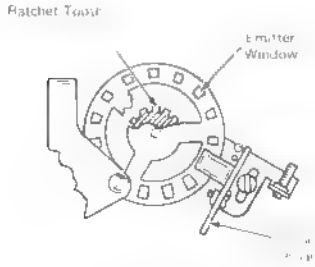
EMITTER

The emitter wheel has one window for each lead screw ratchet tooth (Figure 14)

The emitter is a light emitting diode and the sensor is a phototransistor. The phototransistor conducts when light from the LED passes through the emitter wheel windows. It does not conduct as the light is blocked by the wheel. The signal sent to the logic board as a window passes through the emitter is called an emitter pulse.

The counter is an electronic function in the logic board. It stores a number equal to the number of space units (ratchet teeth) that the carrier is positioned away from the far left margin. As the carrier moves to the right, the stored number increases and as the carrier moves to the left, the number decreases.

As the leadscrew and emitter wheel rotate, the emitter pulses are applied to the counter. When the correct number of pulses have been counted, the logic board de-energizes the leadscrew drive magnets and the escapement magnet.



(Left Side View)

Figure 14 Emitter

LEADSCREW HOMING

When the machine is turned on, it performs a power on reset (POR). During a POR the logic board has to reset the counter, so the carrier is moved to a home position. A homing operation is also necessary when the pitch selector is changed.

During a homing operation, the print shaft rotates one cycle first to operate the escapement mechanism. Then, the leadscrew rotates top-to-rear (reverse drive) until the leadscrew stop contacts the stop screw on the carrier (Figure 15). When the leadscrew stop contacts the screw and the emitter pulses stop for approximately 50 milliseconds, the escapement magnet and leadscrew drive magnets are de-energized. The ratchet is released again by another print shaft cycle. The leadscrew is then rotated top-to-front (forward drive) one unit (one window of the emitter wheel) or to a set left margin. The carrier and leadscrew stop at rest in the home position (zero on the margin scale) or at the set left margin. A margin position will be set only if the power to the logic board has not been removed after the margin was set.

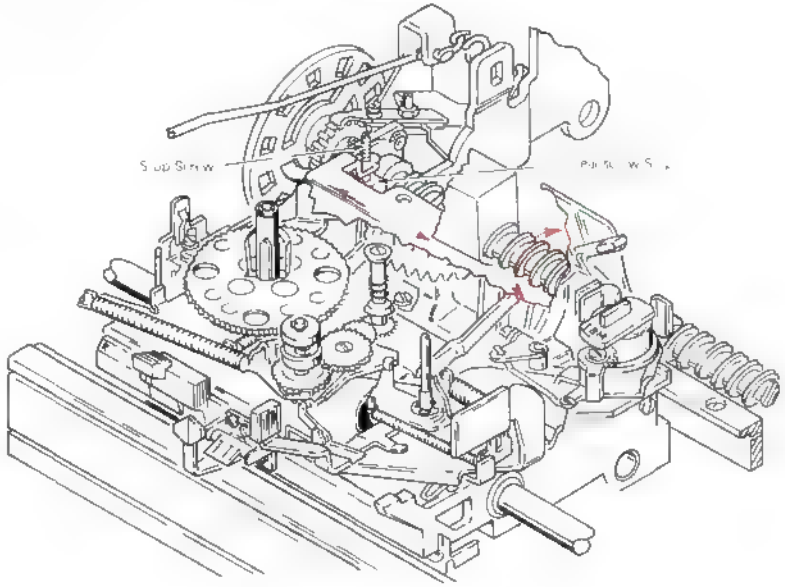


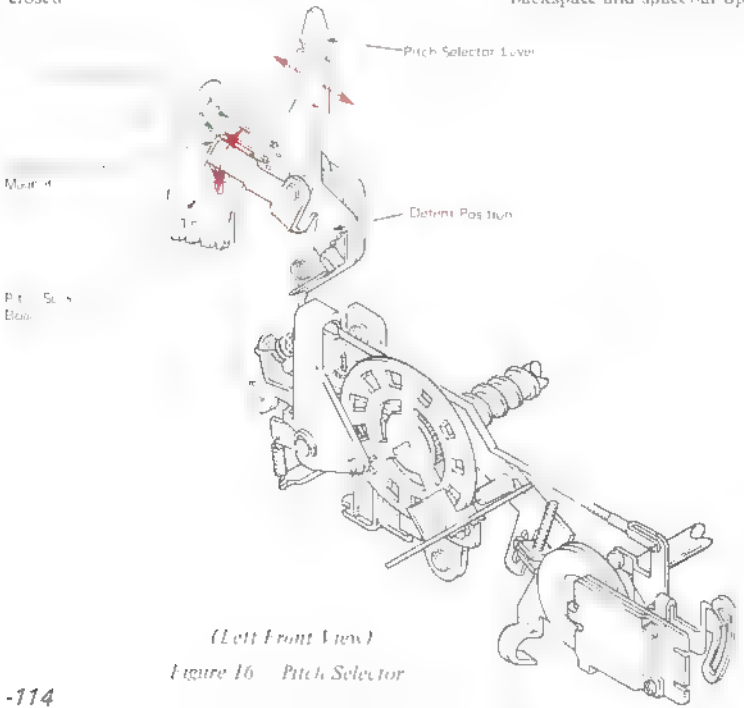
Figure 15 Leadscrew Homing

PITCH SELECTOR

The pitch selector is located on the left of the machine (Figure 16). The pitch selector lever has four detent positions and a permanent magnet. A pitch selector board has two reed switches and is mounted next to the selector lever. With the lever in the forward position (PS) Proportional Spacing, no reed switches are closed. One position back (PSN) Proportional Spacing Numeric, the top reed switch is closed. Two positions back (12P) 12 pitch, both switches are closed, and in the rear position (10P) 10 pitch, the bottom switch is closed.

Each tooth on the leadscrew ratchet is equal to 1.60 inch (approximately 0.42mm) of carrier motion. The escapement chart shows the spacing for each character and the spacebar for both PS and PSN pitch selections. In both PS and PSN, the backspace moves the carrier to the left the same amount as the last character, number or space.

In 12 pitch the leadscrew and ratchet rotate five teeth for each character, symbol, backspace and spacebar operation. In 10 pitch the leadscrew and ratchet rotate six teeth for each character, symbol, backspace and spacebar operation.



(Left Front View)

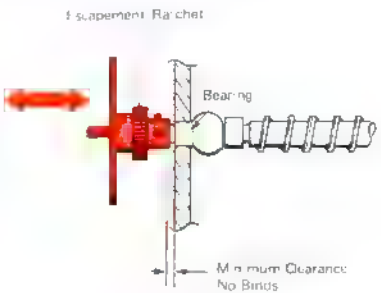
Figure 16 Pitch Selector

ESCAPEMENT CHART					
Character		Escapement	Character		Escapement
A	a	7/5	$	4	5/5
B	b	7.6	%	5	5/5
C	c	7/5	¢	6	5/5
D	d	7.6	&	7	6/5
E	e	6.5	"	8	5/5
F	f	6.4	(	9	5/5
G	g	7/6	)	0	5.6
H	h	7/6	½	²	5/5
I	i	4.3			5/5
J	j	5.3			5/5
K	k	7/6	+	-	5/5
L	l	6.3	,	]	5.5
M	m	7/7			5.5
N	n	7/6			5.3
O	o	7/5		²	5.5
P	p	6.6	¶	³	5/5
Q	q	7.6		,	5/5
R	r	7/5			5.5
S	s	6/5	?		5/5
T	t	7.4			
U	u	7.6			
V	v	7/6			
W	w	7/7			
X	x	7/6			
Y	y	7.6			
Z	z	6/5			
!	1	5/5			
@	2	5.5			
#	3	5/5			

Backspace Value Of Last Char	
Spacebar P/S & PSN	4/4
Spacebar 10P	6.6
Spacebar 12P	5/5
Each 10P Character	6.6
Each 12P Character	5/5

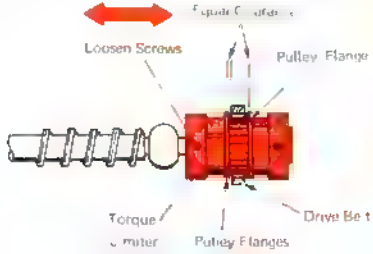
ESCAPEMENT ADJUSTMENTS

1 *Leadscrew End Clearance* Adjust the escapement ratchet left or right for maximum clearance with no binds as the leadscrew rotates. Maximum end play should not exceed .002" (0.05mm).

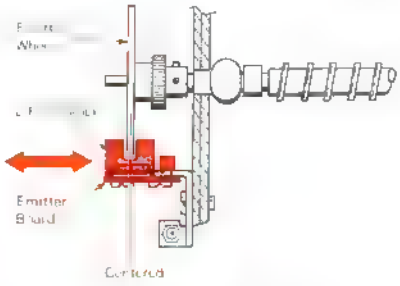


2 *Torque Limiter* Adjust the leadscrew torque limiter left or right so that the leadscrew drive belt operates in the center of the pulley without touching the pulley flanges.

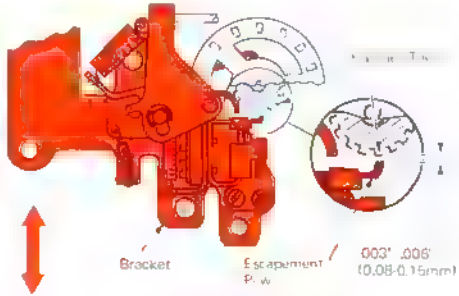
CAUTION. Do not loosen the setscrews in the right of the torque limiter as the preset tension of the torque limiter will be lost.



3 *Emitter Board* Adjust the emitter board left or right so that the emitter wheel is centered in the LED block and the emitter wheel reliably clears each side.



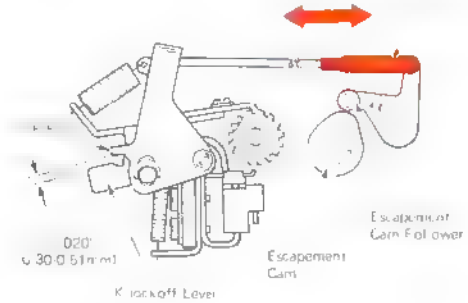
4 *Escapement Pawl Clearance* Adjust the escapement magnet bracket up or down for a clearance of .003"-.006" (0.08-0.15mm) between the escapement pawl and the ratchet teeth. The escapement pawl must be held in the energized position to check this adjustment.



(Left Side View)

5 *Escapement Link* Adjust the escapement link clevis for a clearance of .012"-.020" (0.30-0.51mm) between the stop lug on the actuator and the knockoff lever.

The escapement cam follower must be on the high surface of the cam when checking this adjustment.

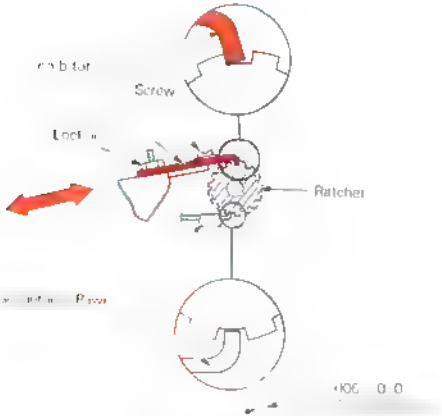


(Left Side View)

6. *Escapement Inhibitor* Adjust the escapement inhibitor front or rear so that the ratchet rotates .006"-.010" (0.15-0.25mm) as the inhibitor is engaged with the ratchet. The ratchet must be rotated manually top-to-front to contact the escapement pawl taen. the inhibitor engaged. The clearance may then be observed between the front of the escapement pawl and the rear of a ratchet tooth. The setscrews in the ratchet should face the rear of the machine for this adjustment.

This same check should be made with the ratchet rotated top-to-rear and also repeated with the setscrews to the front of the machine.

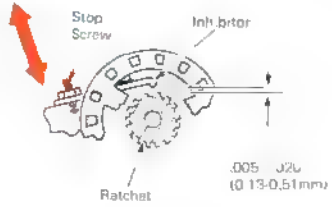
To change this adjustment, the locknut and the screw holding the inhibitor must be loosened.



(Left Side View)

Inhibitor Stop Screw Adjust the stop screw in or out for clearance of .005"-.020" (0.13-0.51mm) between the inhibitor and the ratchet teeth. The actuator should be held to the rear of the machine, removing any play in the escapement link.

The escapement cam follower must be on the low surface of the cam when making this adjustment and the ratchet must be rotated so that the inhibitor and a tooth align.



(Left Side View)

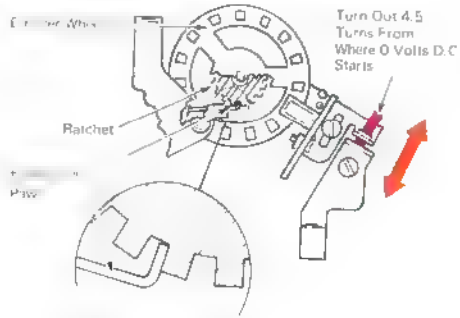
Emitter Bracket

NOTE This adjustment must be made to ensure it is correct, as it cannot be checked.

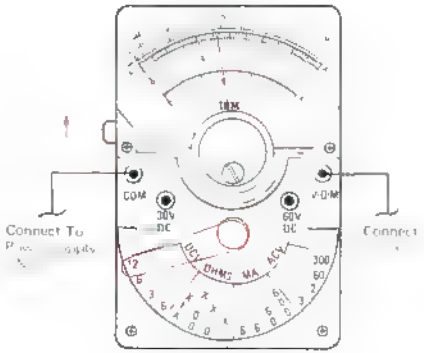
Adjust the emitter adjusting screw out four and one-half turns from the position where the ground shot starts.

To make this adjustment, loosen the screw holding the emitter bracket and hold the emitter wheel top-to-front so that the ratchet tooth contacts the escapement pawl. Connect a VOM (on 12 VDC scale) between GND and EMIT (COM lead to GND), then turn the adjusting screw in until the meter indicates 0 volts between GND and EMIT. Turn the adjusting screw out four and one-half turns from the position where the meter starts indicating 5 volts, then tighten the mounting screw. Make sure that the adjusting screw is held down while tightening the mounting screw.

Caution must be used when tightening the mounting screw to prevent shorting the tip of the screwdriver across the terminals on the emitter board.



(Left Side View)



9 *Leadscrew Stop* Adjust the leadscrew stop radially on the leadscrew so that the top surface of the stop is level with the top surface of the rear rail The leadscrew should be rotated one and one-half to two ratchet teeth (top-to-front) from the position where the carrier contacts the left side frame and then held top-to-rear against the escapement pawl while making this adjustment Loosen the leadscrew stop setscrews to change this adjustment

NOTE The leadscrew homing stop screw may be set level with the rear rail as a guide during this adjustment then readjusted (adjustment 10) when the leadscrew stop has been tightened. Ensure that the end clearance of the leadscrew is not lost as the stop setscrews are tightened

a. Position the carrier approximately six inches from the left side frame

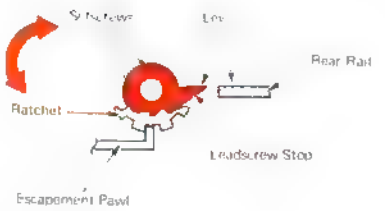
b. Loosen the setscrews on the leadscrew stop

c. Loosen the nut on the leadscrew stop screw and turn the screw until the lower end of the screw is level with the top of the rear rail

d. Operate a POR without a left margin set and ensure that the carrier is against the left side frame

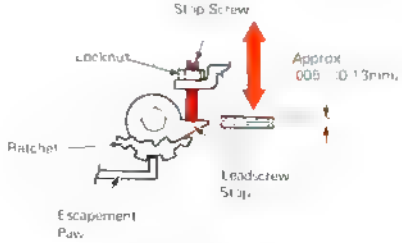
e. Manually release the escapement pawl and rotate the ratchet top-to-front one and one-half to two teeth, then allow the escapement pawl to engage the ratchet

Manually load the ratchet top-to-rear and adjust the leadscrew stop so that the top surface contacts the stop screw, then tighten the setscrews.



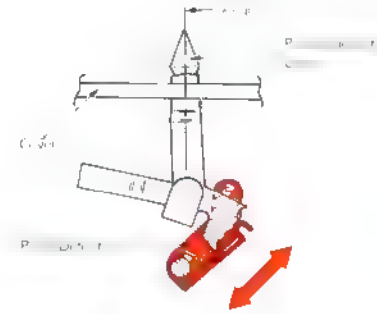
(Left Side View)

10 *Leadscrew Homing* Adjust the leadscrew stop screw in until it moves the leadscrew stop approximately .005" (0.13mm) down, then tighten the locknut The leadscrew ratchet should be manually held top-to-rear against the escapement pawl before the stop screw is adjusted down

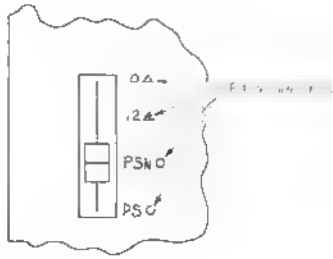


(Left Side View)

11 *Pitch Detent* Adjust the pitch detent up or down so that the pitch selector lever aligns with the indicators on the cover



(Left Side View)



(Top View)

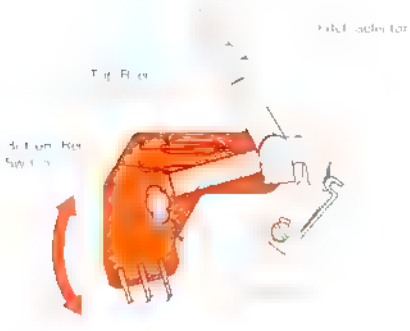
12 *Pitch Selection Board* — Adjust the pitch selection board up or down for the following conditions with

a. Selector in front position (PSF). No reed switches closed

b. Selector one position back (PSN). The top reed switch is closed

c. Selector two positions back (12). Both reed switches closed

d. Selector in rear position (10). The bottom reed switch is closed



PSF — No Switches Closed
PSN — Top Switch is Closed
12 P — Both Switches Closed
10 P — Bottom Switch is Closed

(Left Side View)

The paper feed and index mechanism holds the paper against the platen and moves the paper vertically as the platen is indexed

The paper feed mechanism uses the rear frame for support and contains all the parts necessary to control paper feed (Figure 1)

The paper is held against the platen by the front and rear feed rolls, located under the platen Each feed roll shaft has rubber rollers equally spaced on the shaft

The feed roll shafts mount in the feed roll arm assemblies Each feed roll arm assembly pivots on a pivot stud at the rear frame Flat springs supply tension on the feed rolls

The index mechanism controls the spacing between typed lines and operates when the index or carrier return buttons are depressed

PAPER FEED

As the paper is inserted into the machine the paper guide locates the left edge (Figure 2) Paper guide is mounted on the acoustical hood support near the platen and may be set to a position left or right The paper deflector guides the paper between the rear feed rolls and the platen As the platen is turned, the pressure between the feed rolls and the platen move the paper around the platen The deflector guides the paper between the front feed rolls and the platen As the platen is turned further, the top edge of the paper is guided upward by the card holder

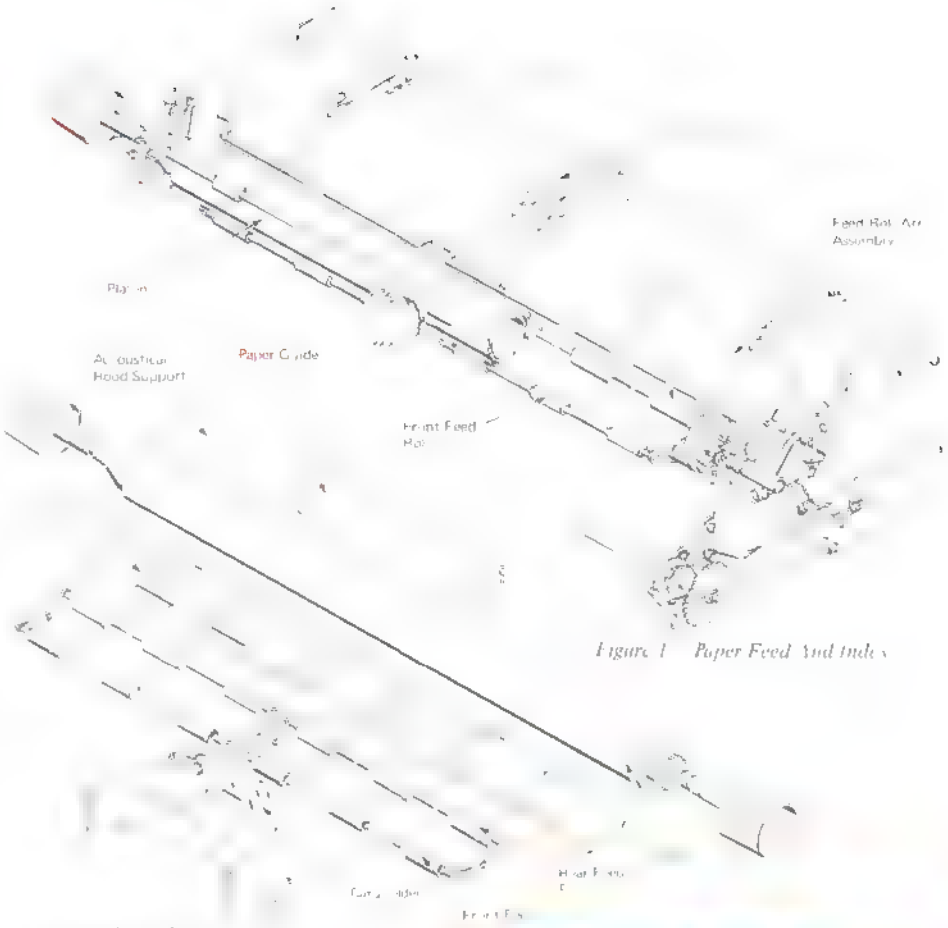


Figure 1 Paper Feed and Index

Figure Paper Feed

Above the writing [illegible] rubber bail rollers on the paper bail (Figure 3). These rollers hold the paper against the platen. The rollers are also used to feed the paper vertically after the bottom of the paper has left the front feed rolls.

The paper bail is supported by a lever at each end and pivots front-to-rear. Toggle springs attached to each bail lever hold the bail rollers to the rear against the platen or forward in the release position.

PAPER RELEASE

The pressure of the feed rolls can be released from the platen to allow the operator to insert and remove the paper easily and change the position of the paper (Figure 4). The paper release lever is located at the right end of the machine. The front of the paper release lever moves the feed roll release bellcrank forward to rotate the feed roll release shaft. The feed roll release shaft then pushes down on the feed roll arms and moves the feed rolls away from the platen. When the paper release lever has been pulled all the way forward, the end of the feed roll release bellcrank detents and holds the release lever in the forward position.

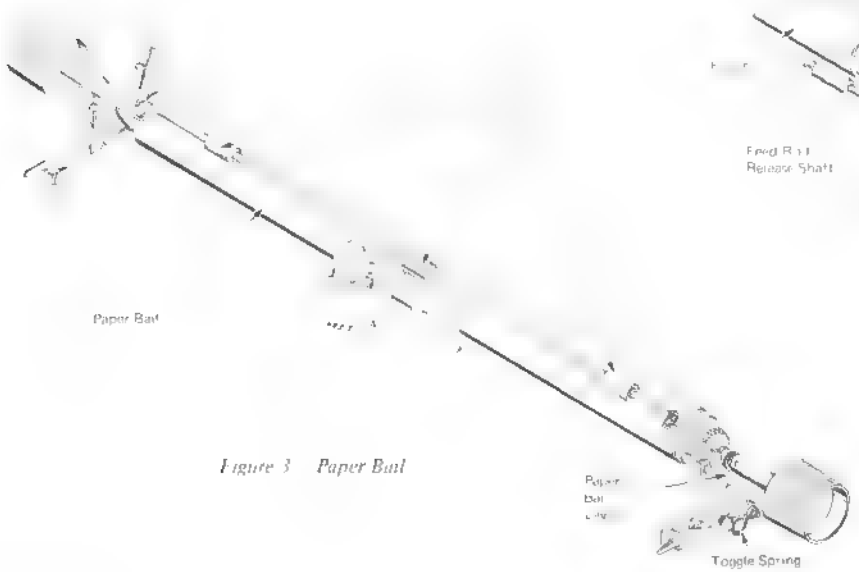


Figure 3 Paper Bail

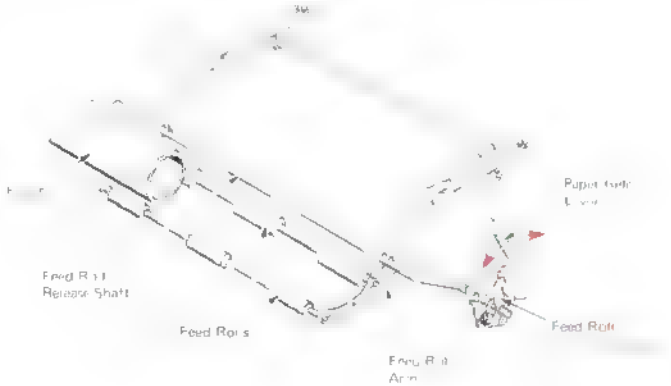


Figure 4 Paper Release

INDEX MECHANISM

The index cam provides motion through the index cam follower, multiplying lever, index link, pawl carrier and index pawl to rotate the platen ratchet (Figure 5). The ratchet is engaged with the platen and rotates with it.

The index cam has a drive pawl mounted on a stud and spring loaded toward drive surfaces on the index driven gear (Figure 6). The pawl is held away from the drive surfaces by the index magnet armature. When the index or carrier return button is depressed, the logic board energizes the index magnet. As the magnet is energized, the armature disengages the index drive pawl which moves into the path of the driven gear drive surfaces. The logic board also energizes the print shaft cycle clutch magnet for two no-print cycles. As the print shaft pulley rotates 720 degrees, the index drive gear, on the side of the pulley, drives the index driven gear 360 degrees. Since the index cam drive pawl engages the driven gear, the cam rotates 360 degrees and operates the index cam follower.

The cam follower transfers motion from the cam, through the multiplying lever and the index link to the pawl carrier and index pawl. The rear of the multiplying lever is in contact with the multiplying lever stop, which is attached to the main frame. The index pawl receives the same amount of motion every time the cam operates.

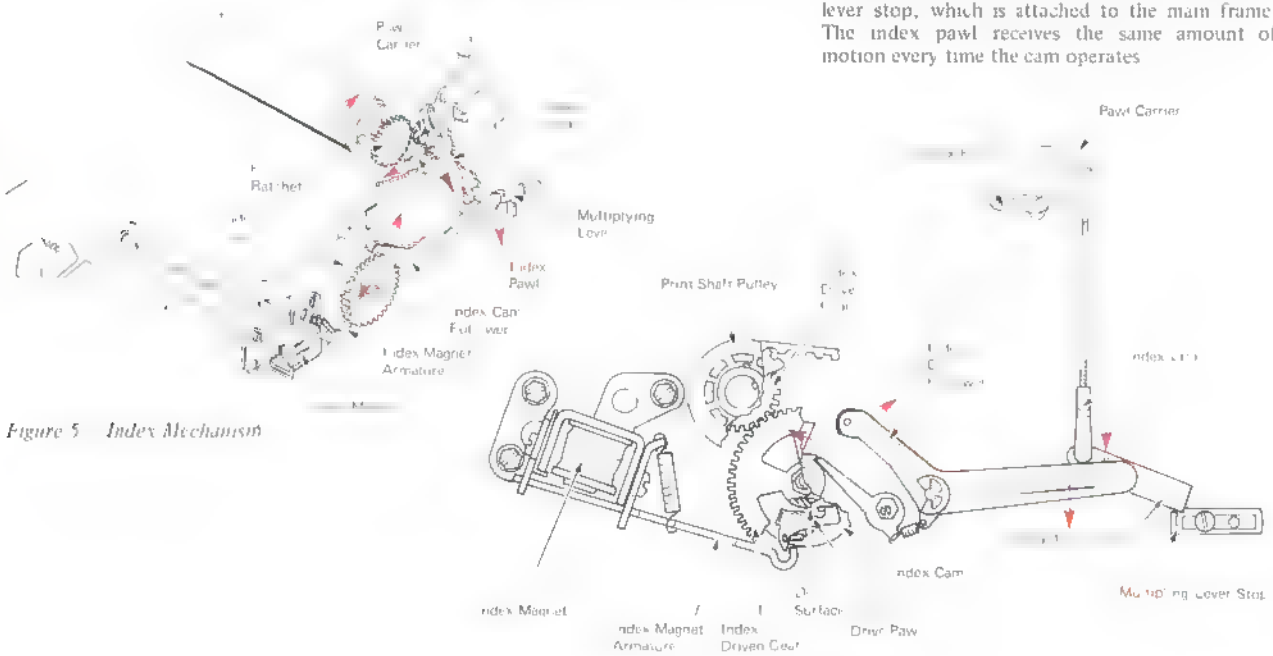


Figure 5 Index Mechanism

(Right Side View)

Figure 6 Index Operation

The index magnet is de-energized after the print shaft has rotated to the 80 degree mark during the first no print cycle. The rear end of the armature then moves up. When the index cam has rotated approximately 355 degrees, the armature engages the index drive pawl (Figure 7). The momentum of the cam causes it to continue rotating until the check pawl engages a latching surface. Once the check pawl has engaged, the armature holds the drive pawl away from the drive surface on the index driven gear.

(Right Side View)

Figure 7. Index Cam Check Pawl

INDEX SELECTION MECHANISM

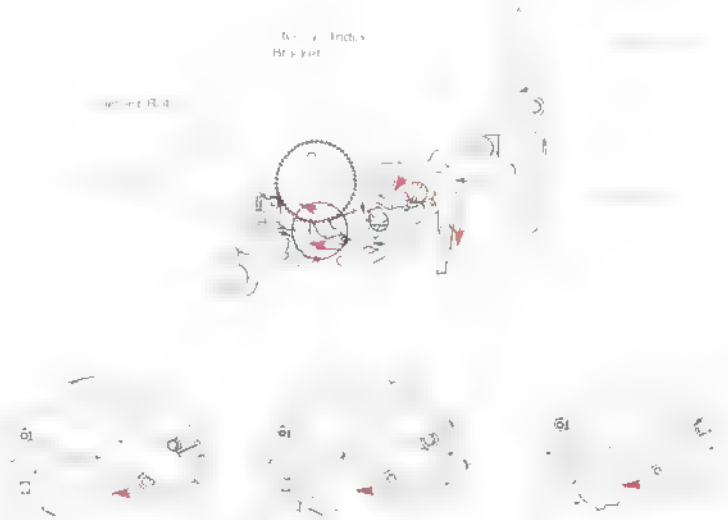
There are three positions for the index lever. The index lever is used to change the position of the index selector. The selector has a slot with three detent notches on the upper side (Figure 8). A stud on the index bracket engages the detent notches. The position of the selector controls index pawl entry.

For a single space operation, the index pawl must be prevented from entering the ratchet until it has passed two teeth of the ratchet. With the index selector lever forward, the selector delays the entry of the pawl into the platen ratchet. The motion after the index pawl enters the ratchet rotates the ratchet two teeth until the pawl contacts the overthrow stop (Figure 8a). The stop prevents any further rotation of the platen. The detent roller is spring loaded into the ratchet teeth and holds the platen at this new position.

In the one and one half line space position, the index pawl is allowed to enter the platen ratchet one tooth earlier than for single line space (Figure 8b). The index pawl then rotates the ratchet three teeth (one and one-half line spaces) until the pawl contacts the platen overthrow stop.

In the double line space position, the index pawl is allowed to enter the platen ratchet two teeth earlier than for single line spacing (Figure 8c). The index pawl then rotates the ratchet four teeth (two line spaces).

The theory discussed has been for a 54 tooth ratchet. Other ratchets with a similar number of teeth operate in the same way. Ratchets with 27 teeth (or similar) advance only one tooth per line space and do not provide half spacing. These ratchets provide three line spaces if the index selection lever is placed in the rear position.



(Right Side View)

Figure 8. Index Selection Mechanism

PLATEN VARIABLE

A clutch which engages the platen and platen ratchet may be disengaged by pressing the left platen knob to the right. While the clutch is disengaged, the platen may be rotated without the ratchet.

The clutch consists of a spring loaded driver which engages fine teeth inside the platen, and two studs on the ratchet (Figure 9). The left platen knob is mounted on a shaft which passes through the platen.

As the left platen knob is pressed to the right, two rods inside the platen contact a spacer which pushes the platen driver to the right. This disengages the fine teeth of the driver and platen. When the platen knob is released, the spring reengages the ratchet.

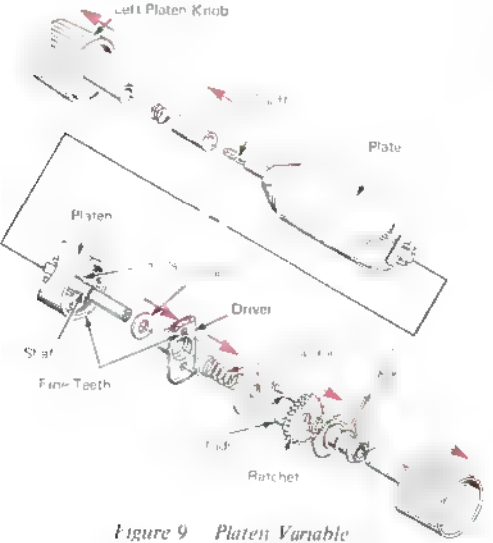
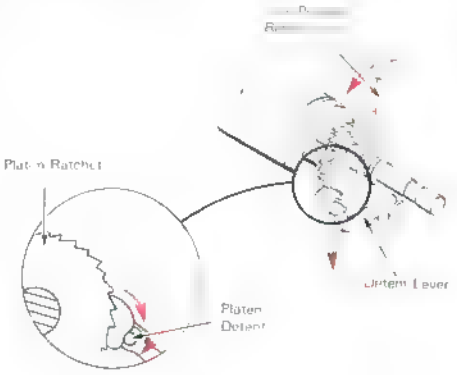


Figure 9 Platen Variable

LINE POSITION RESET LEVER

The line position reset lever mechanism, (Figure 10) located on the right end of the platen, allows the operator to roll the paper away from a typed line and return to it. When the lever is moved forward, the platen detent is disengaged from the platen ratchet. The platen is then free to turn without being detented. When the platen is returned to the approximate typing line, the lever may be returned to the rear. This relocates the typing line by allowing the detent to reengage the same ratchet teeth.



(Left Side View)

Figure 10 Line Position Reset

PAPER FEED & INDEX ADJUSTMENTS

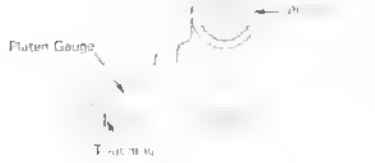
1. *Platen Latches* Adjust the platen latch eccentrics so the platen is held firmly in position vertically and horizontally. The latches should latch and unlatch freely with the feed rolls released.

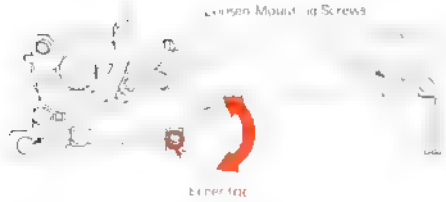
   NOTE The eccentrics should be down toward the bottom.

(Right Side View)

2. *Platen Position (Front To Rear)* Loosen mounting screws (4). Adjust the platen position eccentrics (2) until the platen just touches the platen gauge with the print shaft keyway down and the platen gauge on the print shaft and rear rail

NOTE The eccentrics should be toward the bottom





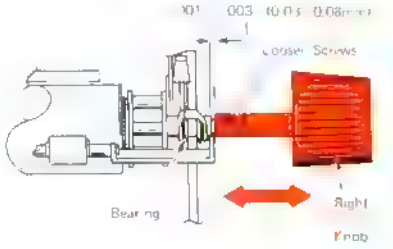
(Right Side View)

3. *Platen (Height)* Loosen Mounting Screws (4). Adjust the platen height eccentrics (2) for even top and bottom printing of all characters

NOTE The eccentric on the right side of the machine should be toward the rear and the one on the left should be toward the front

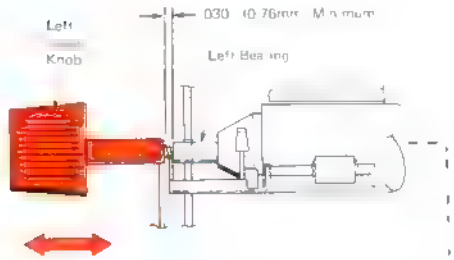
(Right Side View)

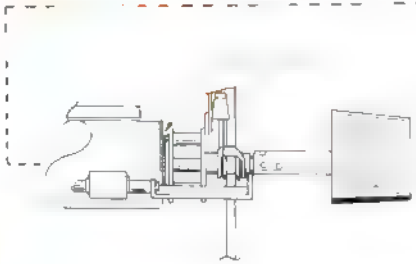
4. *Platen (End Clearance)* Position the right platen knob for .001" - .003" (0.03 - 0.08mm) end clearance at the bearing



(Front View)

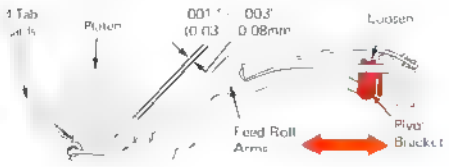
5 *Platen Variable* Adjust the left platen knob for a clearance of .030" (0.76mm) from the left bearing To check this adjustment, the knob should be held to the right so that the platen driver disengages the platen





(Front View)

6. *Feed Rolls (Front to Rear)* Adjust the feed roll arms for a clearance of .001" to .003" (0,03 - 0,08mm) between the rear rollers and the platen. The pivot brackets on the rear frame are adjusted front or rear with four IBM tab cards between the front feed rolls and the platen, and the locking screws loose

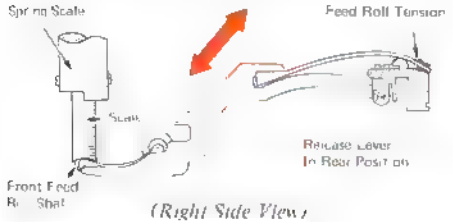


(Right Side View)

7. *Feed Roll Tension* Adjust the feed roll tension screw so the feed rolls have equal tension and the following pressure

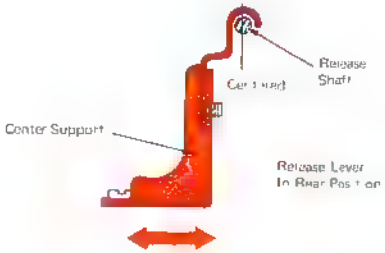
a. 15.1 inch (394mm) machine – 2 00-2 25 pounds (907 2 1020 6 g) pressure on the left and right ends of each front feed roll shaft

b. 19.4 inch (485mm) machine 2 25 2 50 pounds (1020 2 1134 g) pressure on the left and right ends of each front feed roll shaft



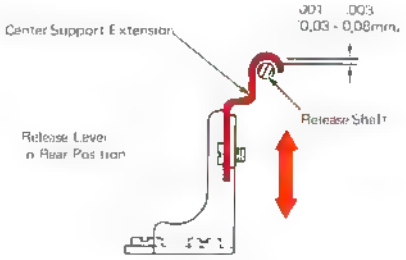
(Right Side View)

8. *Center Support (Front to Rear)* Adjust the center support front or rear to center the top of the support over the release shaft, with the release lever in the rear position



(Right Side View)

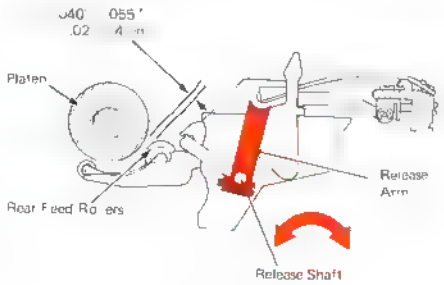
9. *Center Support Extension* Adjust the center support extension for .001" .003" (0,03-0 08mm) clearance between the support and the release shaft This adjustment should be made with the platen installed and the release lever in the rear position



(Right Side View)

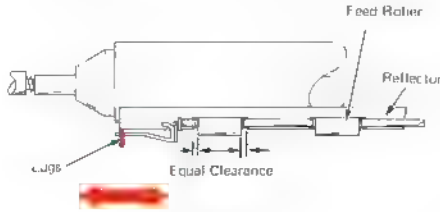
10 *Paper Release* Adjust the release arm front or rear on the release shaft so that the rear feed rollers clear the platen by .040"-.055" (1 02-1,4mm), with the release lever in the forward position

NOTE The release shaft should have .007" - .010" (0,05 - 0,25mm) end clearance



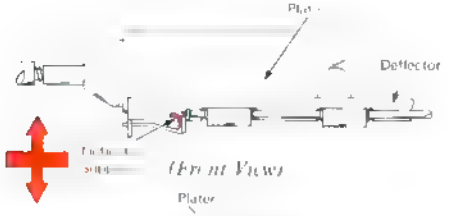
(Right Side View)

11. *Deflector* Form the left deflector lugs so that the deflector holes have equal clearance on the left and right ends of the feed rollers



(Front View)

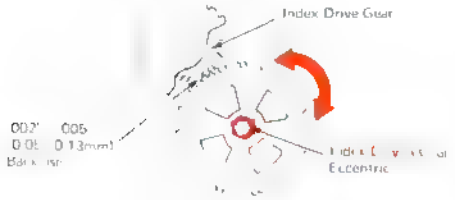
12. *Deflector Height* — Form the deflector supports to provide .010" - .020" (0,25 - 0,51mm) clearance between the deflector and the platen



(Front View)

(Left Side View)

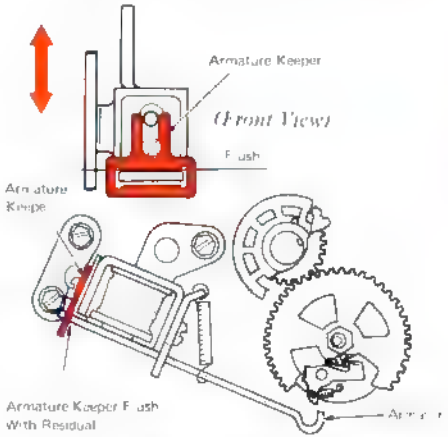
13. *Index Driven Gear* — Adjust the index driven gear eccentric for .002" - .005" (0,05 - 0,13mm) backlash between the driven gear and the index drive gear. The eccentric should be toward the rear.



(Right Side View)

14. *Index Magnet* — Adjust the armature keeper up or down so that the top of the slot is flush with the magnet residual

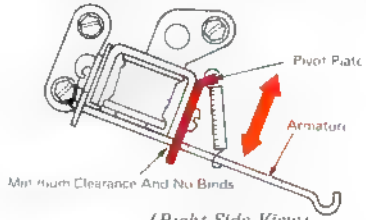
To make this adjustment, the keeper may be moved down to contact the armature with the armature held in the energized position



(Front View)

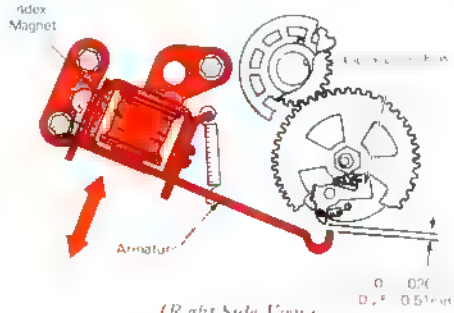
(Right Side View)

15. *Index Magnet Pivot Plate* — Adjust the plate up or down so that the armature can operate without binds and with minimum clearance



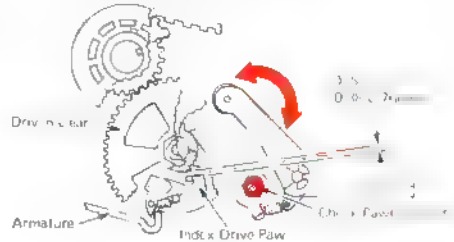
(Right Side View)

16. *Index Magnet Position* — Adjust the index magnet for .010" - .020" (0,25 - 0,51mm) clearance between the top of the index drive pawl and the latching surface of the armature with the index magnet armature manually operated



(Right Side View)

17. *Index Cam Check Pawl* — Adjust the check pawl eccentric so the drive pawl clears the drive surface of the driven gear by .015"-.030" (0,38-0,76mm) With the index magnet armature engaging the index drive pawl, hand cycle the print shaft until the drive surface is aligned with the index drive pawl, then check this adjustment.

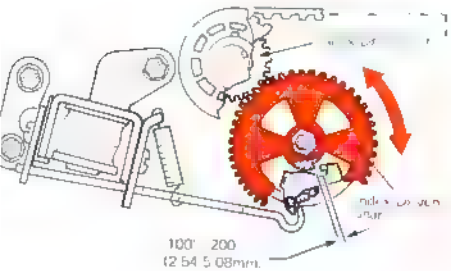


(Right Side View)

18 *Index Timing* - Engage the index driven gear for a clearance of .100"- .200" (2,54-5,08mm) between the index drive pawl and the drive surface of the index driven gear with the print shaft cycle clutch latched

To make this adjustment, loosen the print feedback magnet wheel, remove the print shaft "C"-clip and slide the print shaft to the right to disengage the index drive gear

NOTE The print shaft timing (adjustment 2, Print Section) should be checked before and after this adjustment is changed

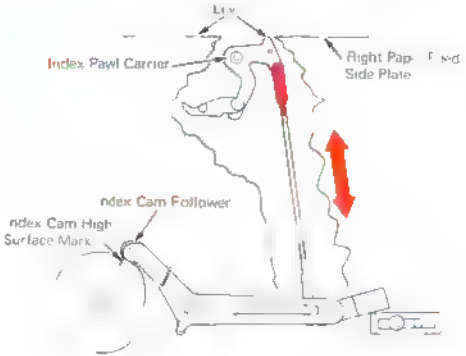


(Right Side View)

19 *Index Motion (Preliminary)* – Adjust the multiplying lever stop so the clearance between the front end of the slot in the stop and the screw is equal to the clearance between the rear end of the slot in the stop and the stud on the side frame

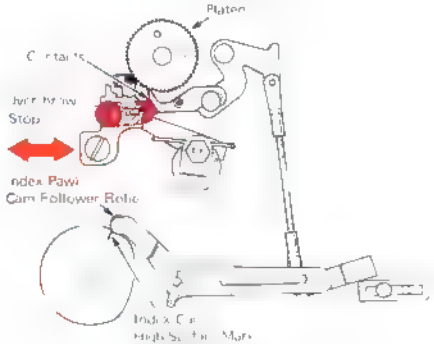
(Right Side View)

20 *Index Link* – Adjust the index link so that the top of the pawl carrier is level with the right paper feed side plate, with the index cam follower on the high surface of the cam (high mark) and the platen removed.



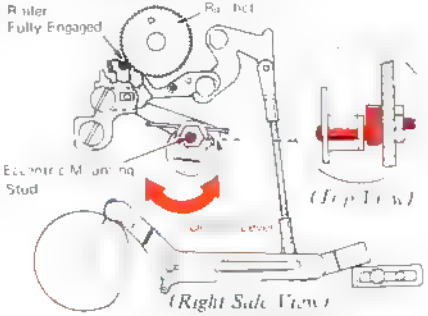
(Right Side View)

21. *Platen Overthrow Stop* Adjust the overthrow stop against the index pawl with the cam follower roller on the high surface of the cam and the platen installed.



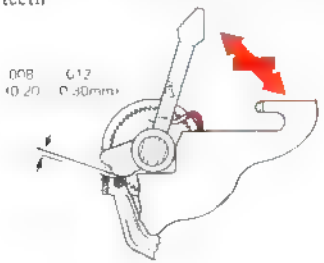
(Right Side View)

22. *Platen Detent* Adjust the eccentric mounting stud to position the detent lever so that the roller fully engages the ratchet teeth The index cam follower roller should be on the high surface of the cam



(Right Side View)

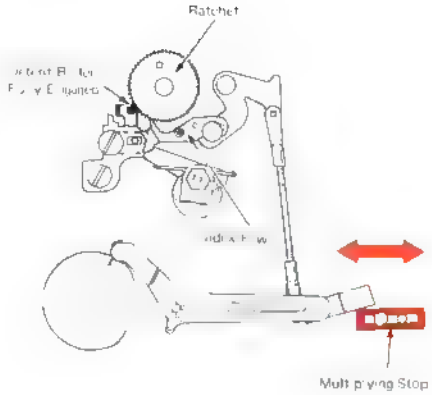
23 *Platen Detent Release Lever* – Adjust the detent release lever stop for a clearance of .008"-.012" (0,20-0,30mm) between the cam surface and the detent roller when the detent roller is fully engaged between the ratchet teeth



(Right Side View)

24 *Multiplying Lever Stop (Final)* Adjust the multiplying lever stop so that the index pawl drives the ratchet far enough for the detent roller to fully engage the ratchet teeth This adjustment should be checked by hand cycling the machine through an index operation with platen in, the feed roll release lever to the rear and five sheets of paper in the machine

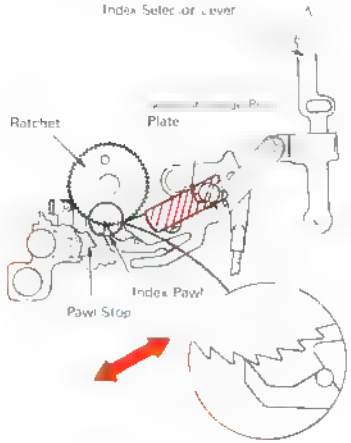
NOTE. If this adjustment is changed, adjustments 20, 21, 22 and 23 should be revised



(Right Side View)

25 *Index Selector* Adjust the selector guide pin plate so that the index pawl contacts the ratchet approximately halfway down the front of a tooth, with the index selection lever in the rear position With the lever in the rear position, the pawl should rotate the ratchet four teeth (three teeth on 27 tooth, etc) before it contacts the pawl stop

After this adjustment has been checked, pawl entry in the other two selector lever positions should also be checked for pawl entry similar to the rear position Readjust if necessary



(Right Side View)

COVERS OPERATIONAL THEORY

The covers protect the machine. The cover assembly has three main sections: top cover, center cover and bottom cover.

The cover design includes an acoustical filter hood to reduce the amount of noise emitted. The hood assembly is mounted on the center cover just above the platen and covers the opening between the top and center covers (Figure 1).

The page end indicator is located toward the rear of the center cover. The indicator also supports the paper.

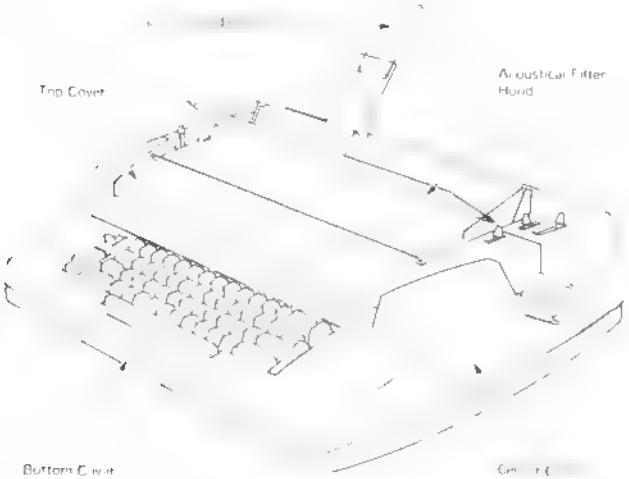


Figure 1 Covers

The bottom cover and center cover are held together by sliding latches at each side (Figure 2). These may be operated from the top of the machine by a medium screwdriver inserted in slots on the latches.

CAUTION: The screwdriver should not be pushed against the center cover as damage to the cover may result.

The main frame of the machine is supported within the bottom cover. Rubber shock mounts locate the machine in the operating position.

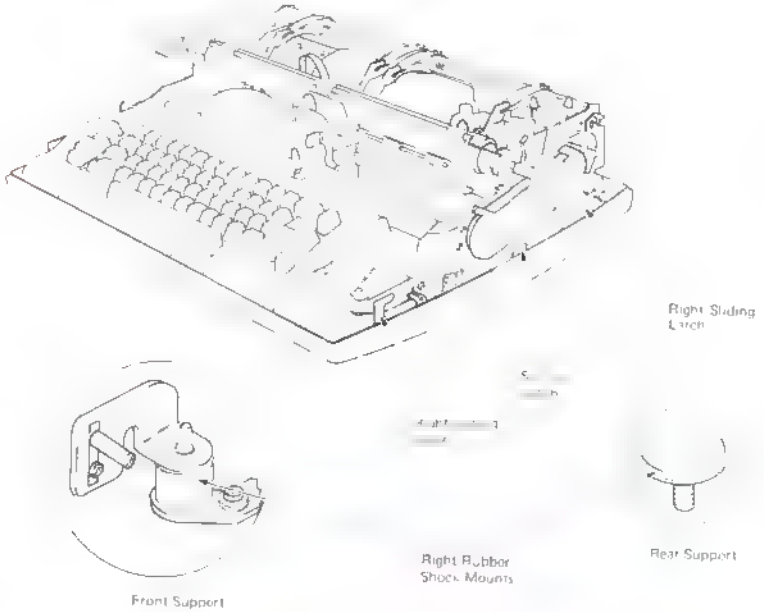
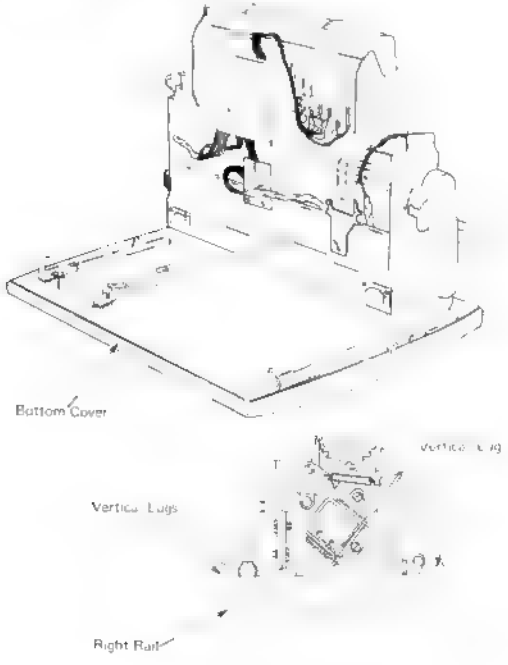


Figure 2 Machine Mounting

The machine may be tilted up for service access and will stand in the bottom cover (Figure 3).

In the tilted service position, the machine is supported on rails in the bottom cover. The rails have vertical lugs front and rear to limit the back and forward movement of the machine as it is being tilted up or set down.



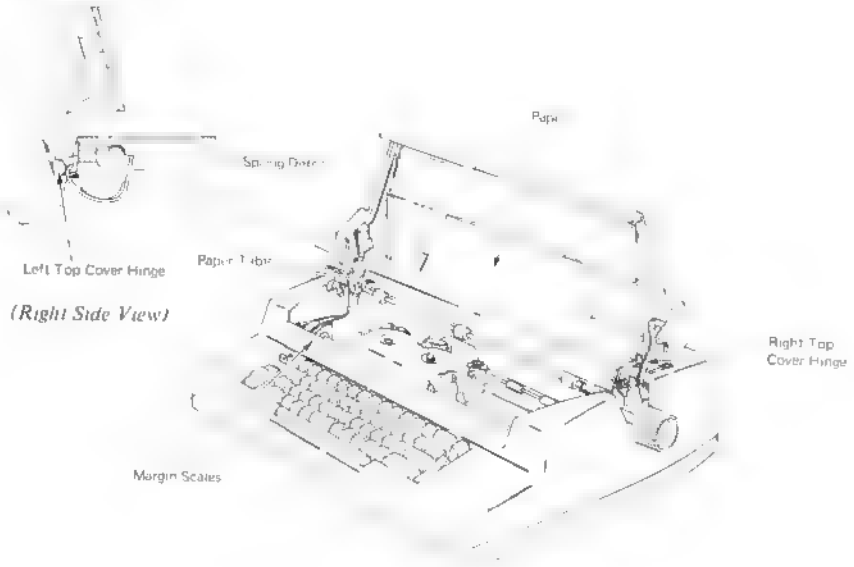
(Right Side View)

Figure 3 Machine Service Position

The top cover hinge assemblies have a spring loaded detent action to hold the top cover in the upward position when open (Figure 4)

Paper is inserted into the machine behind the paper table and in front of the center cover.

A margin scale is attached to the center cover. The scale is numbered in ten and twelve pitches. For proportional spacing, the twelve pitch scale is used.



(Right Side View)

Figure 4 Top Cover

A paper table is mounted on pivots on the center cover (Figure 5). The paper table can be pivoted up so that the platen may be removed. Small springs hold the table down against the platen in the operating position. The surface of the paper table has many small holes and a foam material inside to reduce noise.

A scale on the paper table provides a reference for positioning the paper left or right. The numbers that increase left and right, from a zero mark in the center on the paper table can be used to center the paper.

The belt guard is fitted on the right machine side frame by two screws. This is a safety cover and must always be reinstalled after removal during servicing (Figure 6).

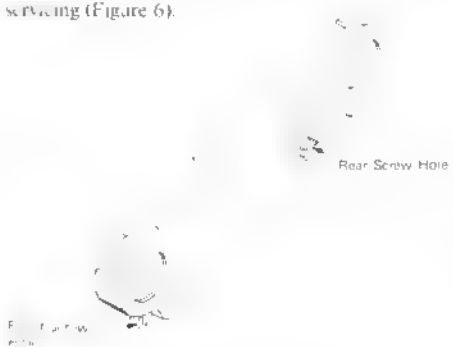


Figure 6 Belt Guard

Two covers (Figure 7) provide safety protection over the power module. These covers also have sound reduction material on the underside. The bottom of the covers mount on the main frame and the top of the covers mount in a slot in the rear paper feed frame.

NOTE. Safety covers must always be reinstalled after removal for servicing.

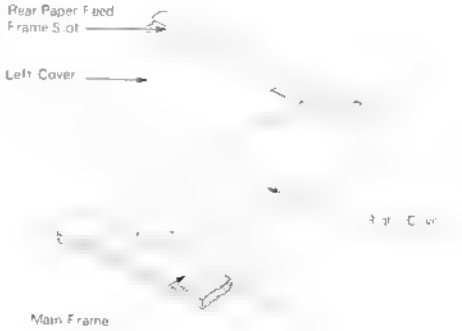


Figure 7 Power Module Covers

(Right Side View)

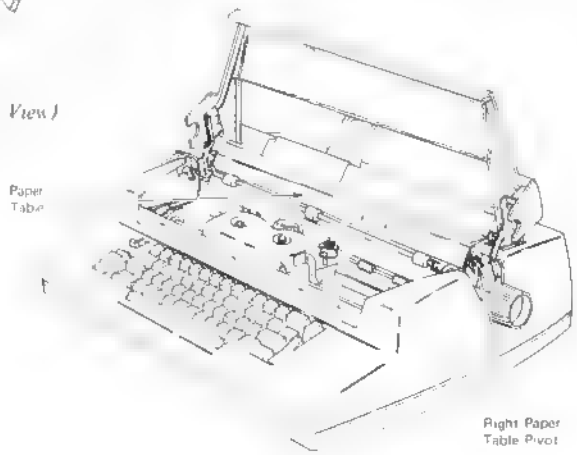


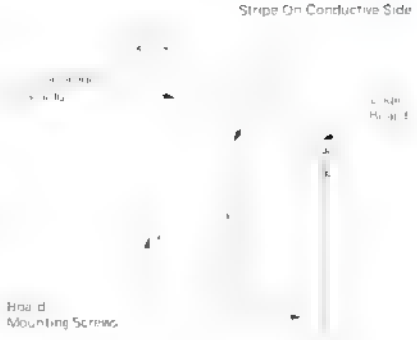
Figure 5 – Paper Table

The logic board of the machine is protected by a dust cover (Figure 8). The cover is mounted in a slot in the machine main frame at the rear and in two spring clips at the front.

(Left Front View)

Figure 8 Logic Board Cover

An interference shield under the logic board provides electrical interference protection to the bottom of the board (Figure 9). This shield is held in place by the board mounting screws and the board support lugs. Care should be taken when reinstalling this shield that the conductive surface is not in contact with the bottom of the board. The conductive surface is marked with a stripe. The mounting screws should tighten against the conductive surface.



(Bottom Right View)

Figure 9 Interference Shield

The leadscrew pulley and torque limiter are covered by the leadscrew pulley guard (Figure 10). The guard is mounted by a screw on the main frame.

NOTE Guard must be reinstalled after removal for servicing.

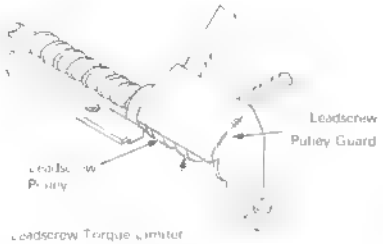


Figure 10 Leadscrew Pully Guard

COVERS ADJUSTMENTS

1 *Top Cover Hinges* Adjust the top cover front to-rear on the hinges to fit flush with the center cover.

2 *Top Cover Latches* Adjust the top cover latches left or right so that the top cover is latched securely in the closed position.

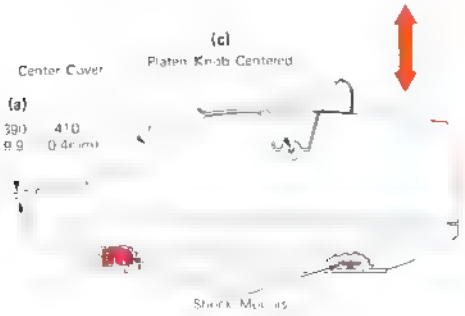
Shock Mounts – Adjust the shock mounts for the following conditions

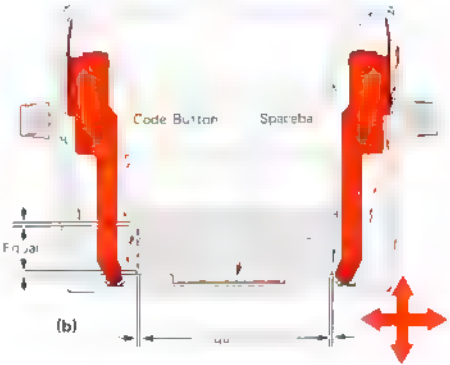
a. The fourth row keybuttons should be .390"-.410" (9,9-10,4mm) above the surface of the cover

b. All openings for keybuttons should have equal front to rear and left to right clearance

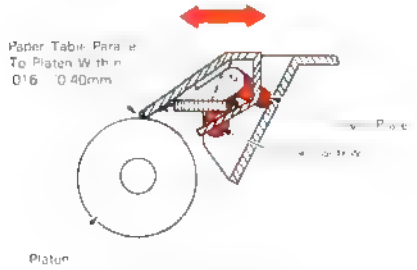
NOTE: Spacebar and code button position may be adjusted separately.

c. The platen knobs should be centered front to rear and top to bottom in the cover openings.



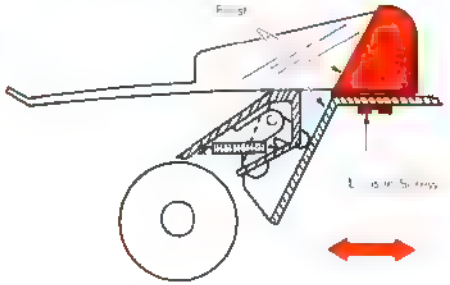


4 *Paper Table* – Adjust the pivot plates so that the front edge of the paper table is parallel with the platen within .016" (0.4mm)



(Right Side View)

5. *Acoustical Filter Hood* – Adjust the hood so that the front edge of the hood support is flush with the front of the center cover. Loosen the mounting screws to make this adjustment



(Right Side View)

MODEL 60 OPERATIONAL THEORY

The IBM Electronic Typewriter Model 60 has only small differences in the mechanisms to the Model 50. The main features that differ are in the logic board.

The Model 60 has some extra controls on the keyboard with wiring to the logic board (Figure 1) These controls are three keybuttons, located left of the code button, and an indicator light. The buttons include a store button, a delete button and an automatic carrier return button.

The buttons are mounted on switch sliders. When the store button is held depressed and a number keybutton is depressed, the indicator light shines. The light indicates that the machine will store information in the logic board as it is keyboarded The logic board can store a maximum of 736 characters (including the function codes as characters) The storage may be separated into a maximum of ten sections, with a total of 736 characters Any one of the ten sections may be used to store 736 characters, but if so, no storage would be available in the other nine sections

If the delete button is held depressed while a number keybutton is depressed, all information stored in that section will be deleted from the storage

The automatic carrier return button latches down when depressed If depressed again, the button will unlatch and move up to the rest position. When the button is down, the carrier will automatically return when a space followed by a character is keyboarded, and the carrier is less than 1/2 inch from the right margin

If a number keybutton is depressed while the code button is held depressed, the logic board will automatically type the information stored in that section. The automatic operation may be stopped by depressing the "N" keybutton

The machine has many other operating control features which are fully discussed in the Operators Instruction Book

The Model 60 does not have the decimal tabulation feature or the proportional space features of the Model 50

The pitch selection control may be adjusted to four positions by the operator There are two ten pitch and two twelve pitch positions This feature provides storage for two sets of tabulation stops and two sets of margins in each pitch The mechanical details of the pitch selection controls are the same for both Model 50 and 60

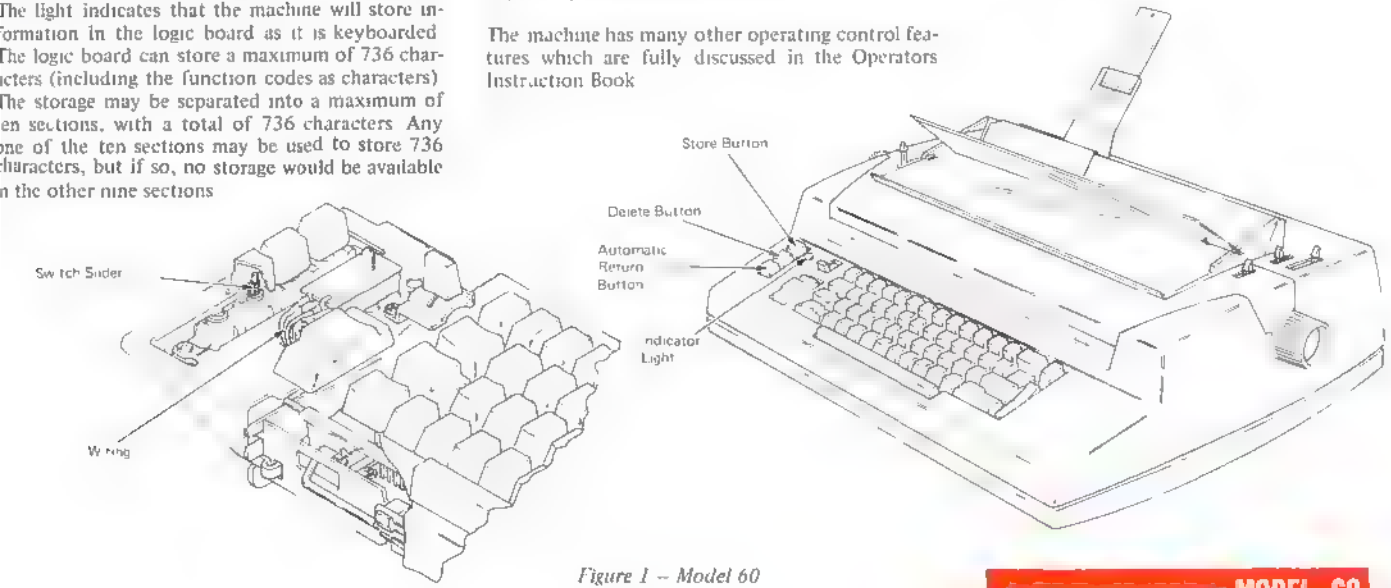
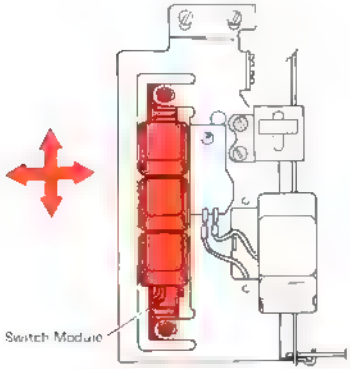


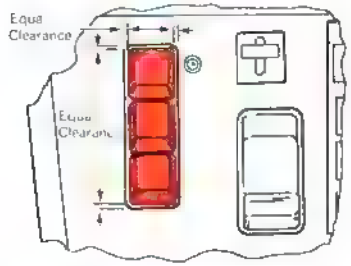
Figure 1 – Model 60

MODEL 88 ADJUSTMENTS

1 *Switch Position* – Adjust the switch module so that the switch buttons are located in the center of the cover openings

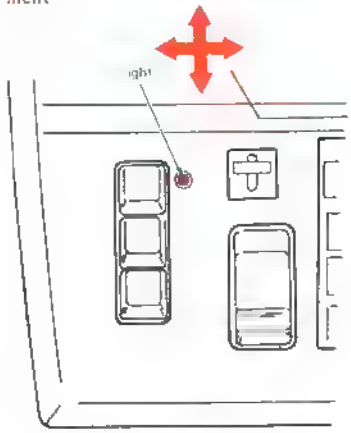
NOTE Ensure that adjustment 3, Covers section, is correct before checking this adjustment





2 *Indicator Light* Adjust the indicator light position so that the light aligns with the opening in the covers

NOTE: Ensure that adjustment 3, Covers section, is correct before making this adjustment



DEAD KEY DISCONNECT AND DUAL LANGUAGE CONTROL

These features are controlled by a lever at the left on the keyboard (Figure 1). A permanent magnet on the lower end of the lever operates reed switches to command the machine to operate in dead key disconnect or in the primary or secondary language

With the control in the forward position, the permanent magnet transfers the rear reed switch and commands the machine to operate without dead key

In the center position, no reed switches are transferred and the machine will print in the primary language mode

With the control in the rear position, the permanent magnet will transfer the front reed switch and command the machine to print in the secondary language

The secondary language feature changes the tilt and rotate selections to suit the secondary language typehead and keyboard. The escapement values and velocity of the characters are also changed to suit the secondary language with this control in the rear position.

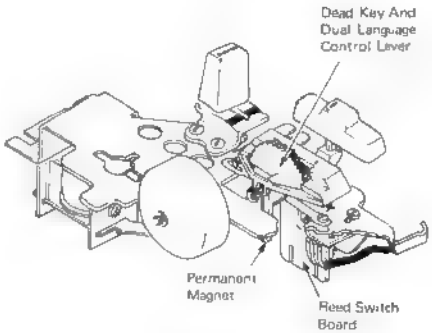
MANUAL VELOCITY CONTROL

The manual velocity control is operated by the manual velocity control lever at the right side of the keyboard (Figure 2). The lever has three positions high velocity, normal and low velocity. The lever must be manually held in the low velocity position to select low velocity for characters which are not normally low velocity. The lever is detented in the normal and high velocity positions and will remain in either of these positions until it is manually moved from them.

The lever is detented in the normal (center) position by the switch actuators.

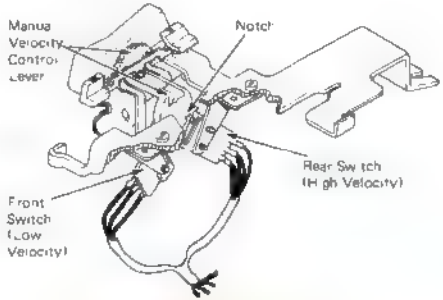
The lever is detented in the high velocity position by the rear switch actuator and the notch in the manual velocity control lever.

When the lever is placed in the high velocity position, the machine will print all characters in high velocity. When the lever is manually held in the low velocity position, the machine will print all characters in low velocity. The manual velocity control lever will restore to the normal (center) position from the low velocity position when the lever is released. In the normal (center) position, the machine will print characters at different velocities



(Left Front View)

Figure 1 Dead Key Disconnect And Dual Language

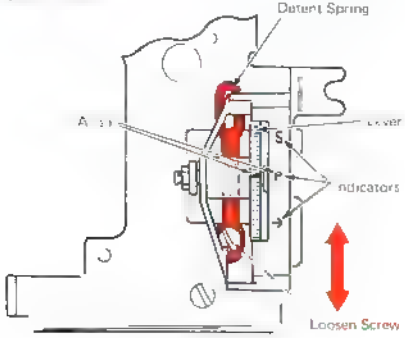


(Right Front View)

Figure 2 – Manual Velocity Control

OPTIONAL FEATURES ADJUSTMENTS

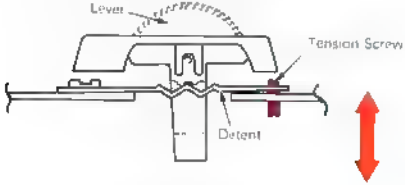
1. *Detent Spring* Adjust the detent spring front or rear so that the lever aligns with the indicators on the guide. The lever should align with the indicator in each of the three positions.



(Top View)

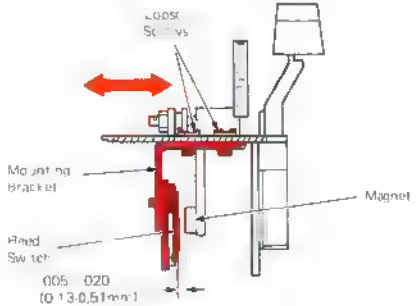
2. *Detent Tension* Adjust the detent tension screw up or down so that the lever is held positively in each position.

To make this adjustment, raise the rear of the detent spring clear of the adjusting screw, then turn the screw in or out.



(Right Side View)

3. *Permanent Magnet Clearance* Loosen the reed switch board mounting bracket and position it left-to-right so the permanent magnet clears the glass envelope of the reed switches by .005" - 020" (0.13-0.51mm).

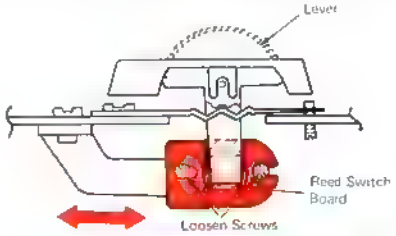


4. *Reed Switch Position* Adjust the reed switch board front or rear so that:

   a. With the lever detented in the front position, the rear switch transfers.

   b. With the lever set in the center position, both switches are not transferred.

   c. With the lever set in the rear position, the front switch transfers.



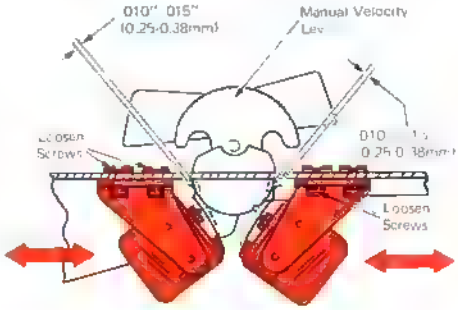
5. *Manual Velocity Control Switches* - Both switches are adjusted front-to-rear to meet three conditions:

   a. So the switch actuators deflect .010" - .015" (0.25-0.38mm) with the manual velocity control lever in the normal (center) position.

   b. So the rear switch will transfer when the manual velocity control lever is detented by the rear switch actuator.

   c. So the front switch will transfer when the manual velocity control lever is manually held in the low velocity position.

NOTE The manual velocity control lever must restore to the normal (center) position when it is released in the low velocity position.



(Right Side View)

This section contains removal procedures for main parts and assemblies. The drawings in the parts manual should be used when more removal or assembly information is required

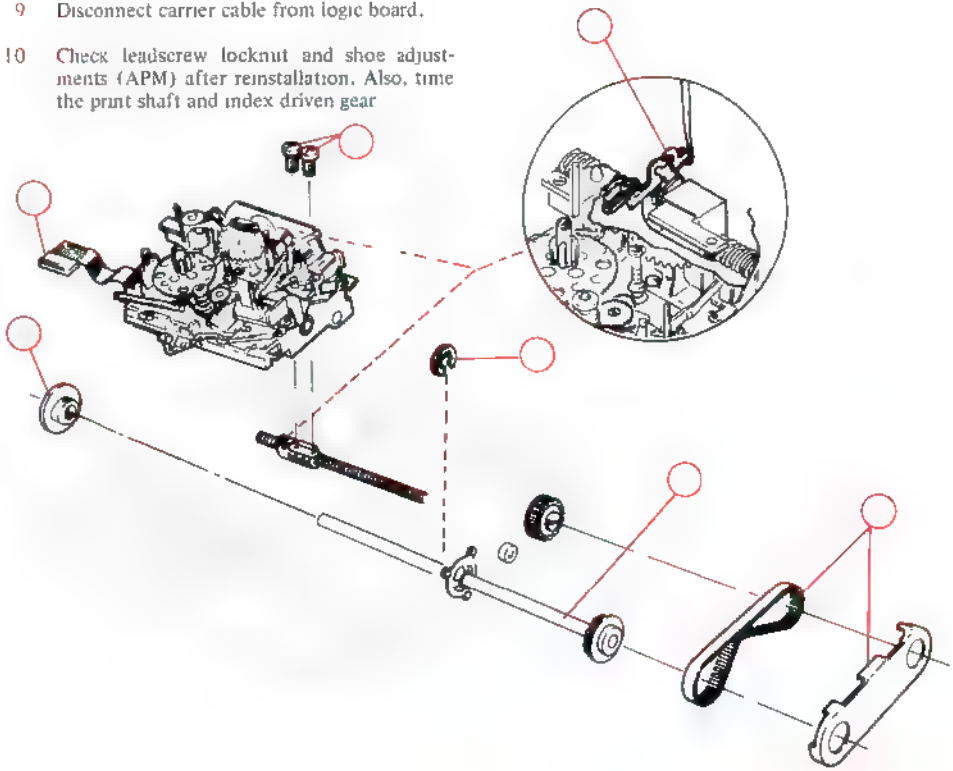
Parts in the drawings shown with the removal procedure are numbered with reference to the removal sequence. Some removals refer to certain steps of a previous removal procedure to prevent repeating information (Refer to the Removal Contents)

The procedures in this section give the most direct method of removal or replacement. Some persons may find another method better for them. These procedures are given only as an aid to service techniques.

CARRIER

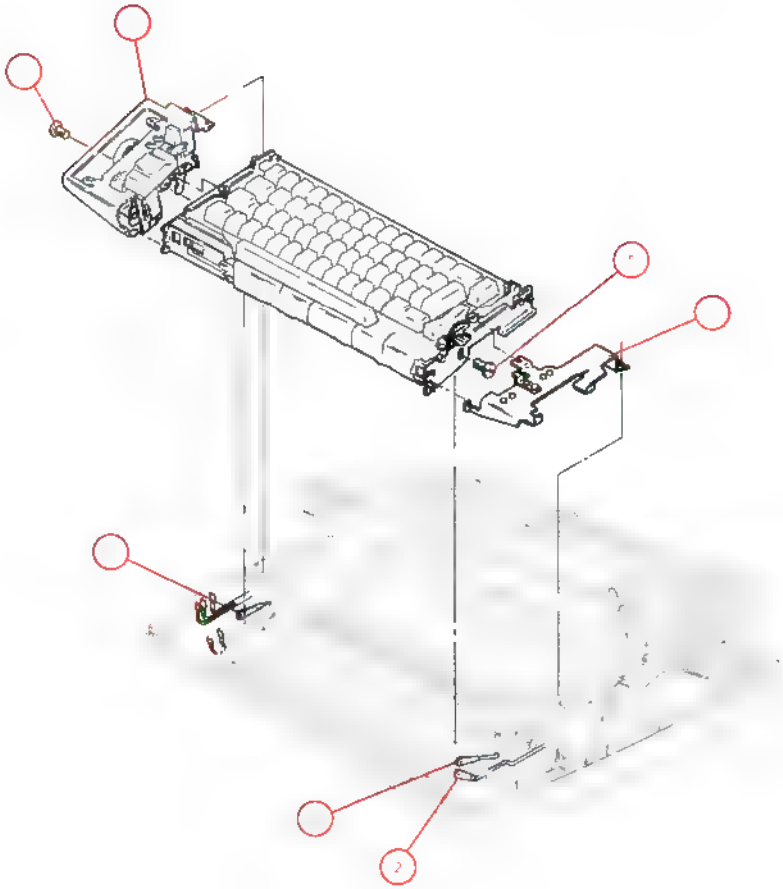
1. Center carrier between right feed rolls
2. Remove two screws from leadscrew nut bracket
3. Use springhook to pull leadscrew lock link from rear.

   CAUTION: When reconnecting link, depress in notch and not on rear of link
4. Loosen setscrews in print feedback magnet.
5. Remove print shaft belt guard and belt
6. Remove clip from right-hand end of print shaft
7. Slide print shaft out while supporting carrier
8. Lift carrier out being careful not to damage cable
9. Disconnect carrier cable from logic board.
10. Check leadscrew locknut and shoe adjustments (APM) after reinstallation. Also, time the print shaft and index driven gear



KEYBOARD – TOP SECTION

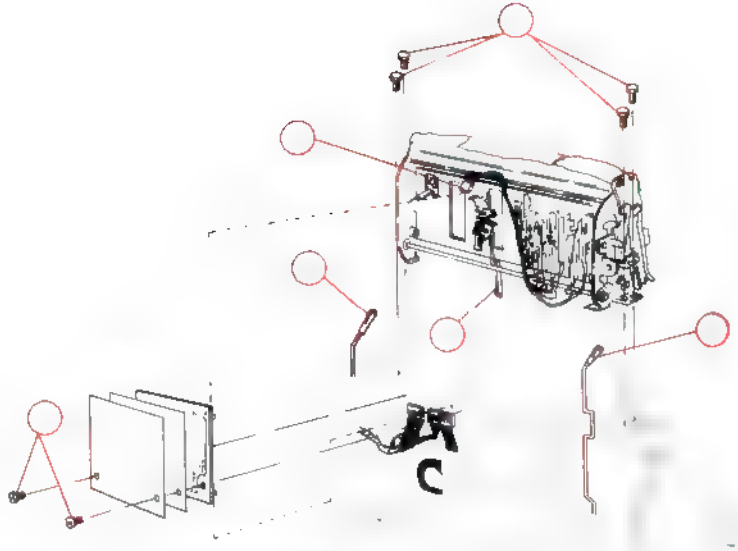
1. Remove outrigger plates
2. Disconnect motor on/off switch link.
3. Disconnect keyboard lock link.
4. Disconnect main power lever link
5. Remove two screws (one on each side).
6. Hold at front and lift top up.
7. Slide toward the front.
8. Check keylever pawl to interposer adjustments after reinstallation (APM)



KEYBOARD - COMPLETE OR CENTER SECTION

1. * Remove outrigger plate(s)
2. * Disconnect motor on off switch link
3. * Disconnect main power lever link
4. Disconnect keyboard release link
5. Remove transmit connector from logic board
6. Remove two screws from logic board
7. Remove four mounting screws from front rail
8. Check adjustments of all Links (APM) after reinstallation

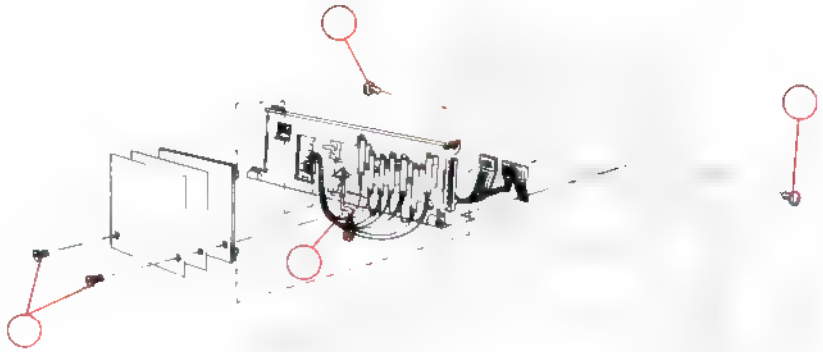
* Refer to Keyboard – Top Section removal



KEYBOARD - BOTTOM SECTION

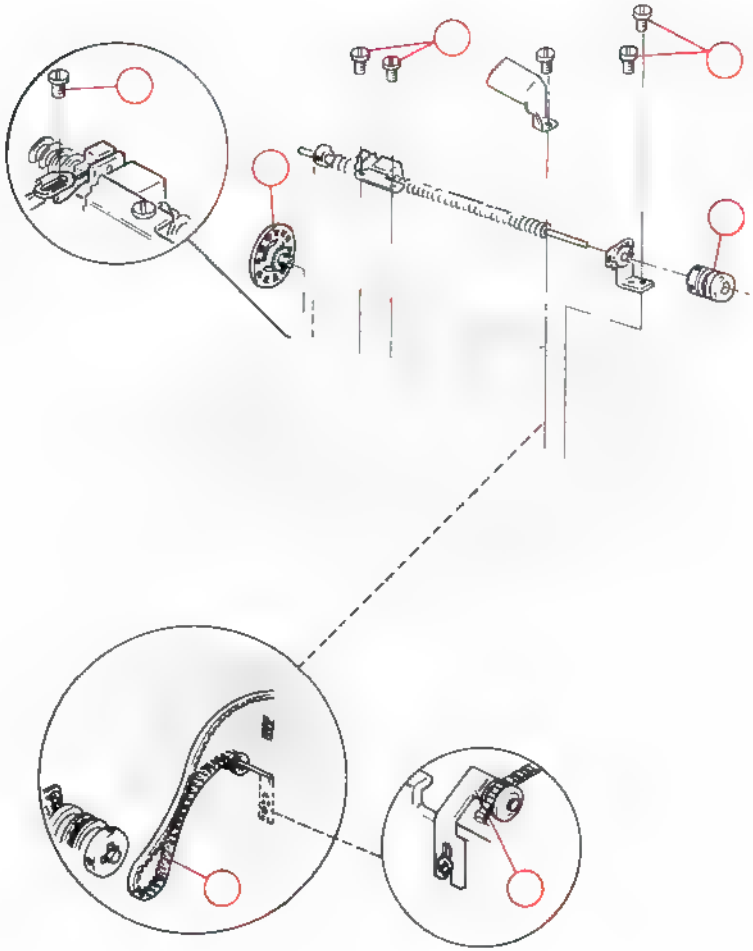
1. Remove screws from logic board. Unplug keyboard cable
2. Disconnect keyboard latch link.
3. Remove two screws in rear (one on each side)
4. Pull down and to rear

NOTE: Ensure all selection bails are free to move and in correct position. Also, ensure that the logic board interference shield is installed with the conductive side down



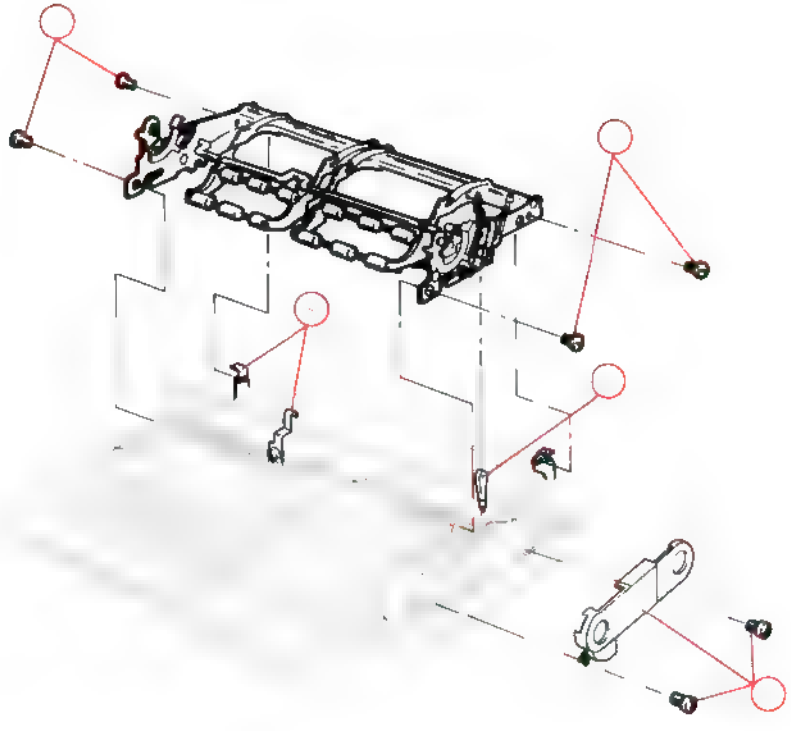
LEADSCREW

1. Remove paper feed assembly. (Refer to Paper Feed Assembly removal
2. Loosen leadscrew drive belt idler gear
3. Remove leadscrew drive belt from torque clutch
4. Remove two screws from leadscrew nut bracket
5. Remove screw from leadscrew lock link
6. Loosen setscrews in emitter wheel
7. Loosen left setscrews in torque limiter clutch and remove clutch
8. Remove two screws in right-hand leadscrew bearing support
9. Slide leadscrew to right, lift and remove leadscrew
10. After reinstallation, check the following adjustments
    a. Torque limiter left-to-right
    b. Leadscrew homing and end play
    c. Leadscrew belt tension
    d. Leadscrew lock



PAPER FEED ASSEMBLY

1. Remove print shaft belt guard (two screws).
2. Remove four screws
3. Disconnect index link (use clamps to hold clevis so adjustment won't be lost)
4. Loosen screw on center support (lift up and release from paper reease shaft)
5. Lift rear of frame and slide toward rear
6. Perform center support adjustments when re-installed.



PRINT SHAFT CYCLE CLUTCH

1 Hold clutch and rotate motor pulley to locate setscrews on arbor.

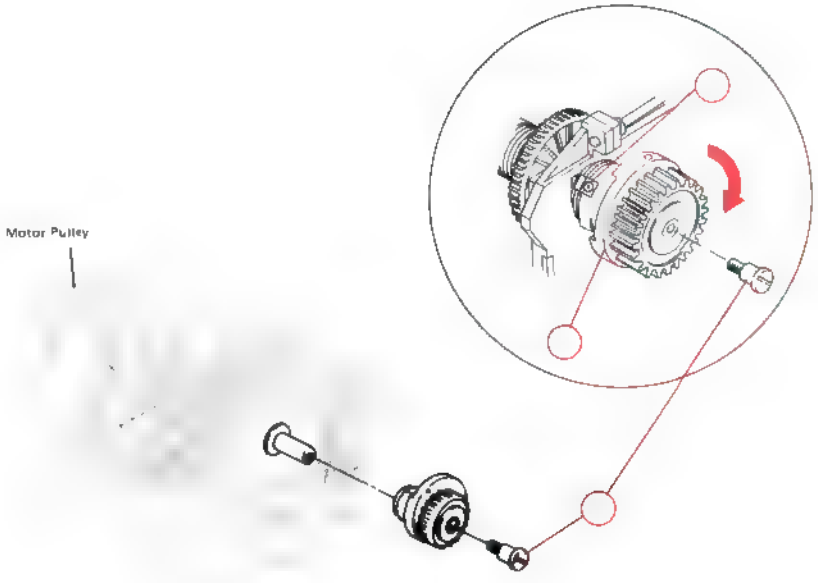
2 Loosen two setscrews on shaft

3 Remove clutch retaining screw (left-hand thread).

4 Slide clutch off

5 Check clutch arbor, shaft end play and clutch slip adjustments on reinstallation.

NOTE: Lubricate clutch before reinstalling end screws.



POWER MODULE

1 Remove motor drive belt

2 Remove print shaft belt guard

3 Remove print shaft drive belt

4 Loosen leadscrew drive belt idler roller mounting screw

5 Remove three screws in paper feed support and remove right-hand paper feed support

6 Disconnect release link clevis and keyboard drive link clevis at keyboard clutch

7 Disconnect spring on keyboard clutch cam follower

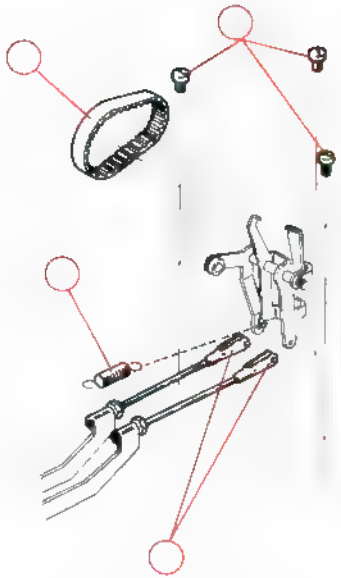
8 Remove four mounting screws, three in bottom one on side

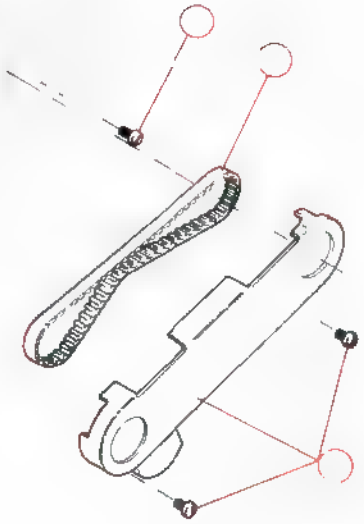
9 Remove leadscrew torque clutch guard

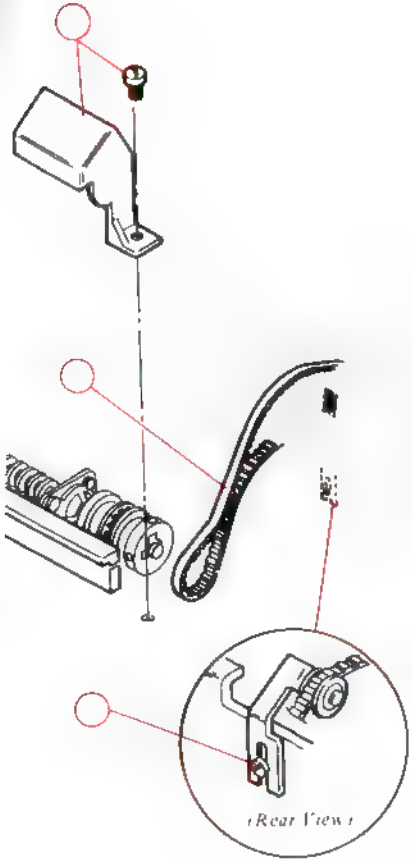
10 Slide leadscrew belt off leadscrew torque clutch

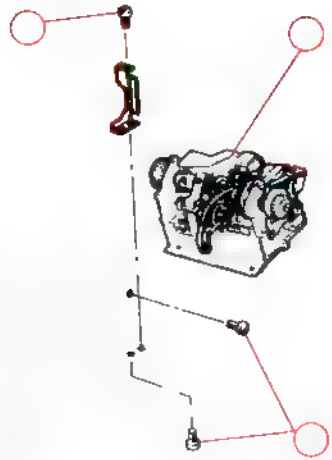
11 Remove power module through rear.

12 After reinstallation, perform leadscrew belt tension adjustments. Time the print shaft and the index driven gear. Use wiring diagram to reconnect any loose wires. Check keyboard release link and drive link adjustments (APM)






‹Rear View›



POWER MODULE LOWER SHAFT

NOTE. Removal of the high speed magnet may allow easier access to parts

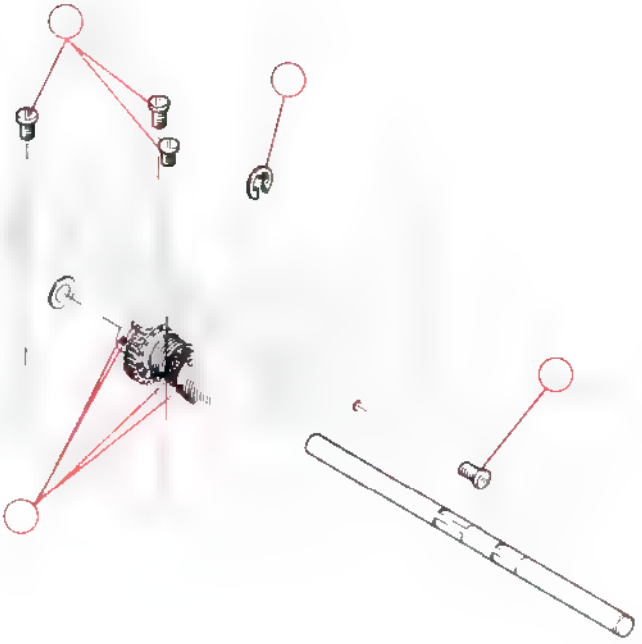
1 Loosen four setscrews on lower shaft

2 Remove C-clip on end of shaft

3 Slide shaft out of power module

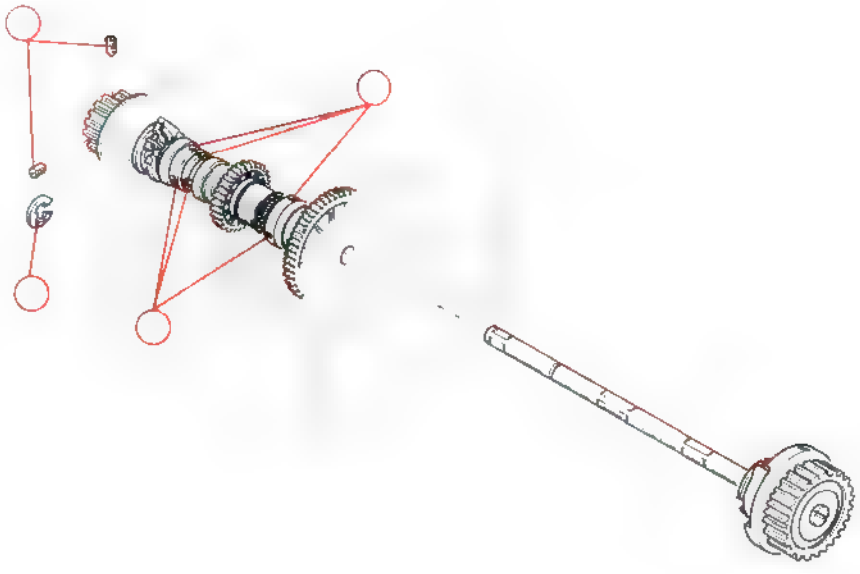
NOTE. Loosening the four power module screws and raising the power module may make this step easier The release and drive link adjustments would then require checking

4 Perform end play adjustments after reinstallation



POWER MODULE UPPER SHAFT

1. Remove print shaft guard and belt (Do not remove cycle clutch screw.)
2. Loosen setscrews on upper shaft
3. Remove C-clip on shaft
4. Slide shaft out right side of power module.
5. Perform shaft end play and arbor adjustments after reinstallation



PRINT SLEEVE

1 Remove ribbon plate

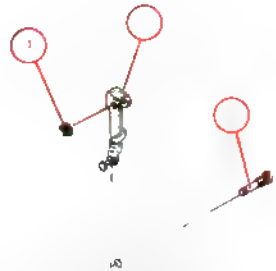
2 Remove carrier (see carrier removal)

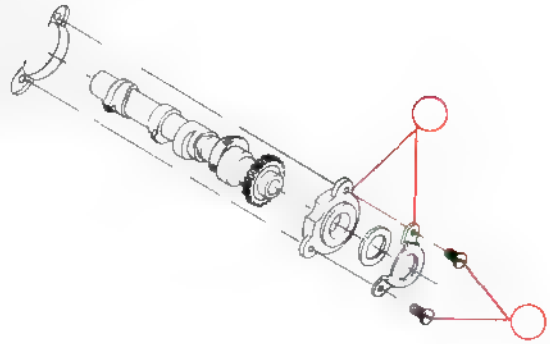
3 Remove screws holding left wiper retainer and remove print shaft bearing

4. Remove C-clip holding velocity slider restoring cam follower.

5 Loosen screw enough to remove cam follower.

6 Slide print shaft sleeve assembly to left and remove



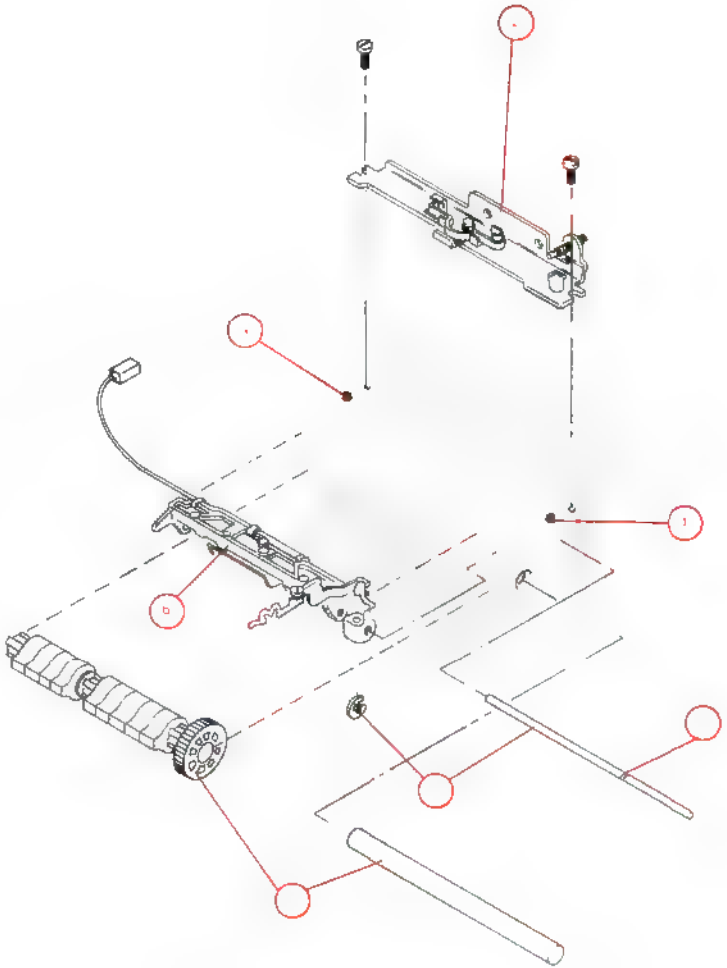


ROTATE RACK SOLENOID ASSEMBLY

1. Remove carrier (see carrier removal).
2. Remove carrier back plate.
3. Remove selection cams (see selection cam removal)
4. Loosen setscrews holding bail shaft
5. Remove "C" clip and push shaft from carrier
6. Remove assembly through bottom of carrier
7. Check character selection adjustments after reinstallation

NOTE. As an aid to reinstallation of the new solenoid assembly, the following steps may be used

a. Break removed shaft at groove.
b. Replace new assembly shaft with shortened shaft, to align parts.
c. Install new assembly in carrier
d. Install new shaft in solenoid assembly in carrier
e. Reverse steps 1-5 above.

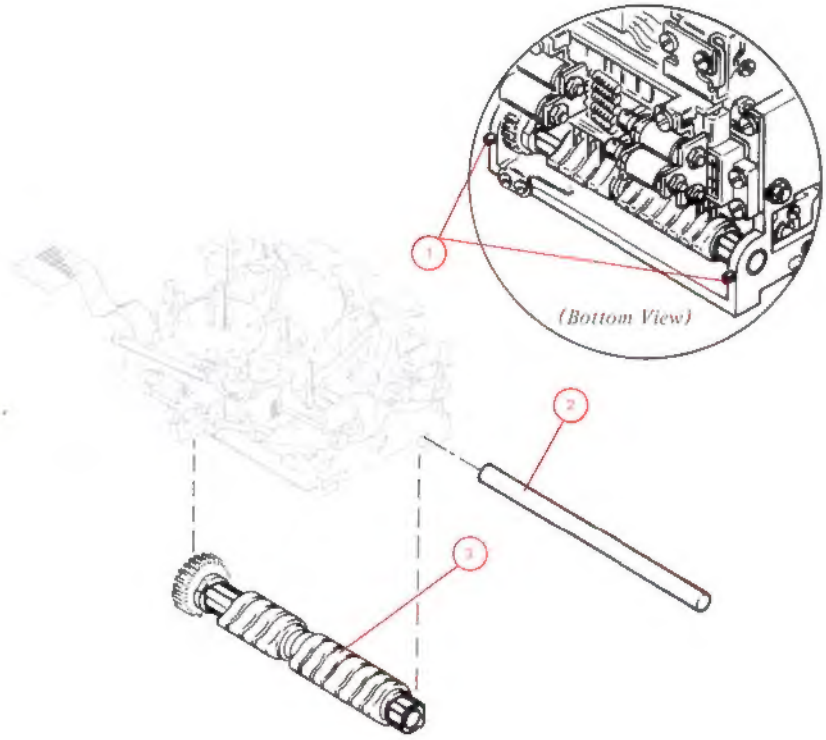


SELECTION CAMS

1. Loosen two setscrews on bottom that hold shaft.
2. Push shaft from end with small screwdriver.
3. Remove selection cams.
4. Install tool to hold pins in place. *See selection pin installation.
5. To reinstall make sure tilt ring is in home "0" tilt position. Also, rotate cam follower is in home "0" rotate position.
6. After reinstallation, check cam timing (APM) (if new cams). Check all selection adjustments (APM).

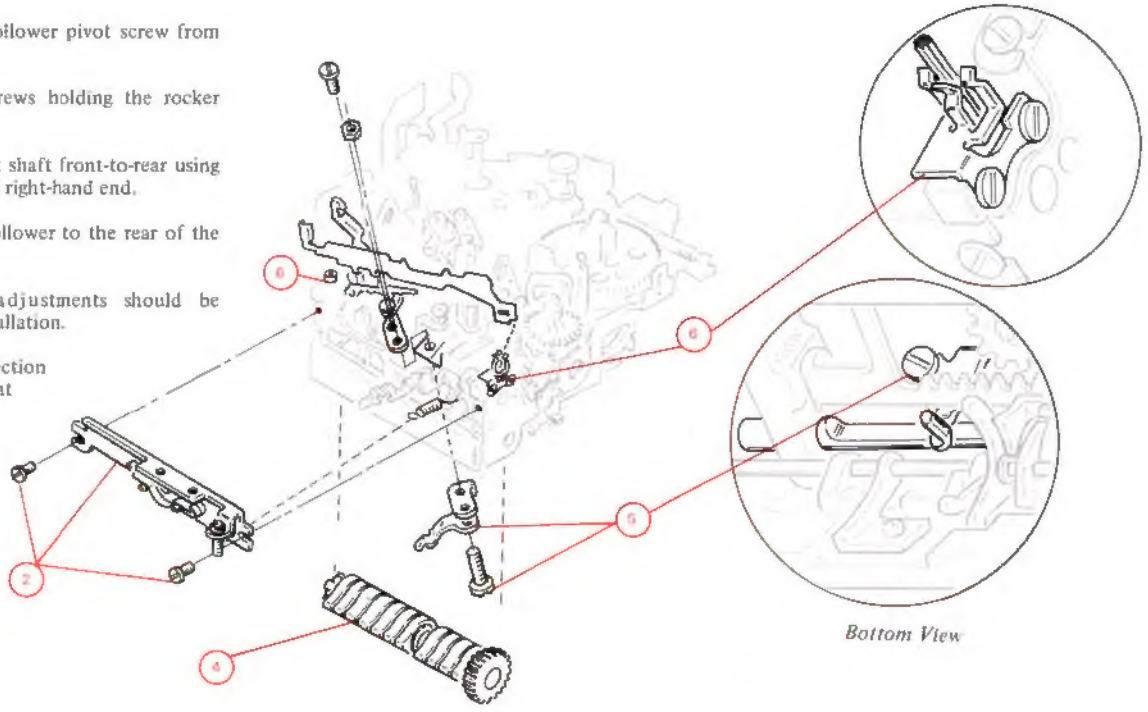
*SELECTION PIN INSTALLATION

To install selection pins in the pin block, hold all installed pins in the restored position. This will remove the tension on the selection vanes and allow installation of additional selection pins. A flat tool such as the steel rule may be used to hold the selection pins in the restored position.



TILT CAM FOLLOWER

1. Remove carrier (refer to carrier removal).
2. Remove carrier back plate.
3. Remove tilt pivot nut and bellcrank.
4. Remove selection cams (refer to selection cam removal).
5. Remove tilt cam follower pivot screw from bottom.
6. Loosen both setscrews holding the rocker pivot shaft.
7. Rotate rocker pivot shaft front-to-rear using a screwdriver on the right-hand end.
8. Remove the cam follower to the rear of the carrier.
9. The following adjustments should be checked after reinstallation.
   a. Character Selection
   b. Fine Alignment



Bottom View

LUBRICATION GUIDE

CAUTION: Because oil and grease affect rubber, special care should be taken to prevent lubricants from contacting the platen, feedrolls, paper bail rolls, rubber mounts and drive belts.

Carrier	
Tilt Bellcrank Pivot	No. 10
Leadscrew Nut And Lock	No. 10
Rear Carrier Shoe	No. 10
Print Shaft Wipers	No. 10
Velocity Cam Follower Roller	No. 10
Correcting Tape Feed Latch Pivots	No. 10
Tape Lift Actuator Pivots	No. 10
Correcting Latch	No. 10
Correcting Tape Feed Cam Follower Pivots	No. 10
Correcting Tape Load Lever Pivot	No. 10
Correcting Tape Feed Swing Arm	No. 10
Correcting Tape Spiked Wheel Pivot	No. 10
Correcting Tape Feed Bellcrank Pivots	No. 10
Selection Vanes Support Shafts	No. 10
Selection Pins	No. 10
Velocity Slider Latching Surface	No. 10
All Non-Rotating Bearing Surfaces Not Otherwise Specified	No. 23
Correcting Tape Lift Arm Mounting And Pivots	No. 23
Ribbon Lift Control Lever	No. 23
Ribbon Feed Pawl	No. 23
Ball Joint	No. 23
Tilt Ring Pivots	No. 23
Velocity Cam Follower	No. 23
Impression Control Lever Pivot	No. 23
Selection Sleeve And Cams (Thin Covering)	No. 23
Rotate Rack Plate Rear Pivots And Cam Follower	No. 23
Tilt Cam Follower	No. 23
Rear Carrier Shoe	No. 23

Keyboard	
Keyboard Clutch Surface	No. 10
Key Lever Pawl Spring Contact Area	No. 23
Key Lever Restoring Spring Contact Area	No. 23
Front Interposer Guide And Fulcrum Rod	No. 23
Filter Bail Surface	No. 23
Filter Bail Pivots	No. 23
Shift Bail	No. 23
Repeat Keylevers At Leaf Springs	No. 23
Keylever Return Spring	No. 23
Keylever Fulcrum Rod And Pivots	No. 23
Spacebar Pivot Points	No. 23
Filter Bail Guide LH And RH	No. 23
Selection Bail Pivots	No. 23
Keyboard Mode Latch	No. 23

Power Module And Motor	
All Bearings	No. 10
Leadscrew Belt Idler	No. 10
Print Shaft Cycle Clutch Spring And Arbor	No. 23
Motor Pulley And Shaft	No. 23
Keyboard Clutch Spring And Arbor	No. 23

Main Frame	
Leadscrew Bearings	No. 10
Leadscrew	No. 10
Link And Clevis Pins	No. 10
Platen Bushing	No. 10
Balls In Comptube	No. 6
Rear Interposer Guideslots	No. 6
Bottom Cover Latches	
Top Cover Latches	No. 23
Escapement Ratchet	No. 23
Escapement Cam Follower And Pivot	No. 23
Escapement Link Clevis	No. 23
Paper Guide Groove	No. 23
Top Cover Hinges	No. 23

Clean the following as necessary and **do not lubricate:**

Ribbon cartridge, spindles and spools, outside of typehead, platen, motor mounts, wiring, correcting tape lift guide, correcting tape supply and take-up spools, cycle clutch magnet armature keeper and escapement magnet core, solenoid plungers.

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Customer Engineering

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